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THE GEOGRAPHICAL REVIEW

VOL. V

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No. 1

A SIBERIAN WILDERNESS: NATIVE LIFE ON THE LOWER YENISEI*

By H. U. HALL

University of Pennsylvania Museum

If it is true that man is to a marked degree what his surroundings have made him, it is no less true that he struggles to shape those surroundings to a form that shall coincide with his imaginings of things as he would like them to be. If he cannot by manipulation of what is tangible about him modify his environment to his taste, he is likely to set up in the realm of his imagination a place of fictitious solace in which he can find relief from circumstances which prove too hard. Nature is adamant, and even by strenuous labor and in the most favorable circumstances he can no more than scratch on the surface a fleeting picture of what face he would have her show to him. Transplant him to a region where sun and soil are less complaisant, and he will trace strange pictures in the snow and hold as articles of faith tales of heroes or saints or shamans whose virtue (that is, power to transcend the limits of human endeavor in conflict with irrevocable nature) lies in producing conditions comparable to those in which toil could produce crops and blossoms and practicable paths. Yet these very figments of his brain are the products of his surroundings. He paints on the canvas of things as they are a picture of conditions suggested as their opposite, just as the sight of an empty platter conjures up a vision of heaped viands to the eye of a hungry man. So the Tungus of the Arctic wilderness sets beside the grave of the shaman, who to him represents the acme of human, or super-human, success against the old enemy nature, or super-nature, a crude arrangement of trimmed logs to stand for the horse which he has never seen. The tribal memory has preserved through the ages this relic of the days when the reindeer, which is now his only mount, was but the quarry of the hunter. And so the Russian monks on the fringes

* Some notes concerning a year's stay in the Arctic on behalf of the University of Pennsylvania Museum. For an account of the expedition of which the author was a member see *Geogr. Rev.* for September, 1916 (Vol. 2, pp. 229-230).

of the Arctic embroider the legend of an uncanonized saint, whose body was brought by a pious brother to grace their foundation, with fantastic touches of a flowery mead in which the uncorrupted corpse lay in mid-winter and of blossoms which hedged a firm pathway through the marshes when Tichon brought the good Vasili to his shrine.

The Turukhansk District of the Yeniseisk Government of Siberia, with its sparse population of native tribes still very largely unmodified by contact with Russians, and its conditions, Arctic or sub-Arctic, little modifiable by any human means, affords an excellent field for the study of people living among surroundings as uncongenial to human life as can well be conceived—people who have adapted themselves, nevertheless, to those conditions with a contentment and cheerfulness sustained by that unquestioning faith which sees flower beds in snowdrifts and steeds fit for shamans in the frozen tundra. The comfortable balance struck between things as they are and things as they might be, or the ignorance of what things might be elsewhere, has been disturbed only by the meddlings of their civilized masters, whose profitable business it is to awaken in them desires for things they never knew they lacked and to acquaint them with the prices the civilized world pays for its luxuries and the gratification of its lusts.

EARLY SETTLEMENTS

The Russians long ago reached at any rate the outskirts of the Turukhansk District; and, unsuitable as the region is for colonization by Europeans, small Russian settlements are scattered along the banks of the Yenisei as far as its mouth, dwindling, as the Arctic Circle is neared and passed, from groups of two or three houses to solitary log huts at great distances from one another. The merchants of Novgorod in the eleventh century sent goods by sea to the country about the mouth of the Ob and Taz and reached the same region also by making use of the system of rivers and lakes which intersects the Yamal, or Samoyed, Peninsula between 70° and 70° 20' N. latitude.¹ The *ostrog* (stockaded post) of Mangazea on the Taz grew into a flourishing settlement between 1581 and 1762, at which latter date it was destroyed by the Yurak. For a considerable part of this time there was a busy trade route between Mangazea and the coast of the White Sea; and the Moscow merchants received valuable cargoes of furs in exchange for their shipments of tea, spirits, gunpowder, and guns to the natives. Mangazea was the first administrative and commercial capital of Siberia, after the "conquest" of Yermak put the official seal on the process of penetration, peaceful and otherwise, which had long been going on. In 1610 was founded Turukhansk on the Turukhan River, which flows into the Yenisei from the northwest some distance north of the 65th parallel. Turukhansk was for a long time the administrative center of the Turukhansk

¹ See B. M. Shitkov: *Die Erforschung der Samojedenhalbinsel (Jamal)*, with map, 1:1,750,000, *Petermanns Mitt.*, Vol. 57, Part II, 1911, pp. 11-14, 67-71.—EDIT. NOTE.

District; but in 1909 this distinction passed from it to the village of Monastir on the opposite bank of the Yenisei, where it is joined by its great right tributary the Lower Tunguska. Locally this latter settlement is still known as Monastir, though its official designation, in spite of the crumbling survival of the other group of log huts, is now Turukhansk. It received the name Monastir from a monastery, still in existence, founded at this spot in the middle of the seventeenth century.

In the sixteenth century English merchants trading with Archangel, in the course of attempts to discover a Northeast Passage to the Indies, reached the Ob. By the end of that century Dutch mariners were rivaling the English in the White Sea trade and the search for a Northeast Passage, although handicapped in the competition through the granting to English traders by the Moscow government of special privileges denied even to Russians.

The Russians apparently became suspicious of this active movement of foreigners towards the inhospitable coasts of their new possession and decided to keep the trade with Siberia exclusively in their own hands. The Moscow government began to build sea-going ships for the transport of goods between Archangel and Mangazea. At this time—the first quarter of the seventeenth century—colonization of tundra and *taiga* was much more extensive than at present. Mangazea, Turukhansk, and Yeniseisk became important settlements. Finally, in 1620, the sea route, closed to foreigners in 1616, was barred even to private Russian traders, and communications with Mangazea were kept up only for the benefit of the administration, which continued to receive abundant *yassak* (tribute from natives) and large quantities of valuable furs, reckoned the perquisite of the government. The result was that colonization languished. Mangazea, long before its destruction in 1762 by the Yurak, was almost deserted. What traffic there was, was kept up by the land route across the Yamal Peninsula. Not a keel furrowed the Kara Sea for 250 years.

THE KARA SEA ROUTE

In 1859 a rich Siberian merchant, by the name of Sidoroff, conceived the idea of reopening the Kara Sea route, which is practicable for a few weeks during the summer. It took him fifteen years to accomplish his purpose; and in 1874, Captain Wiggins, an English sailor, working in co-operation with Sidoroff, brought his steamer into the Yenisei. Next year Norden-skiöld, in the *Vega*, reached the mouth of the river. In 1876, for the first time, European (English) goods reached Yeniseisk by steamer direct from Europe. In the ten years from 1877 to 1887 thirty-four steamers attempted the passage, but only fourteen with success. Between 1887 and 1898, English traders having been given the privilege of using this route without paying duty on goods brought by it, more money was invested, and a greater degree of success was attained. During these eleven years, thirty-



FIG. 2—A Yenisei-Ostyak in the outskirts of the *taiga*, or northern forest, near Monastir-Turukhansk, 50 miles south of the Arctic Circle. The Yenisei-Ostyak bow is the type of the compound bows used throughout the Turukhansk District. The making of bows for their neighbors is still an industry of the Yenisei-Ostyak. (All photos, except Figs. 4, 9, and 10 from the University of Pennsylvania Museum.)

six vessels made the voyage, and cargoes averaging about 1,000 tons a year, consisting chiefly of mining and agricultural machinery, reached Siberia by this route.

This trade did not a little to develop civilizing influences in Siberia; but in 1898 restrictions on imports were re-imposed, and, as a consequence, not a single foreign vessel passed through the Kara Sea to Siberia for six years. In 1905 duties were again removed, and twenty-two vessels came to the northern coast of Siberia. The vacillating policy of the Russian government in the matter of these imposts manifested itself more than once in the following years, with the result of discouraging enterprise. Some two years before the war, however, a company was formed with directors in London, Christiania, and Petrograd for the purpose of promoting trade with central Siberia via the Kara Sea and the Yenisei, and what promised to be regular traffic between Krasnoyarsk and western European ports had been established.²

THE TURUKHANSK DISTRICT

The Turukhansk District forms the northern portion of the Yeniseisk Government, the administrative division of Siberia which includes the west-central part of the colony (map, Fig. 1). Its northern extremity, Cape Chelyuskin in the Taimyr Peninsula, is the nearest point of the Eurasian mainland to the Pole. It includes the greater part of the basin of the lower Yenisei, from the Stony (Middle) Tunguska to the Arctic Ocean, and marches with the outer limits of the Ob and Lena basins on its western and eastern borders respectively. It is officially stated to comprise an area of 1,616,734 square versts (about 718,500 square miles). Its surface is intersected by a large number of streams, many of considerable size, of which the chief, apart from the great main stream of the Yenisei itself, are the right tributaries of the Yenisei, the Middle and Lower Tunguska, and the Kurëika; its left tributaries the Kas, the Yelogui, and the Turukhan; flowing north, to the west of the Yenisei, the Taz; flowing north, to the east of the Yenisei, the Pyasina, the Taimyr, the Kheta-Kotui-Khatanga, and the Anabara; flowing southwest and south, respectively, into the Lower Tunguska, the Syevernaya and the Limpa. These, with their tributaries small and large, make of the region east of the Yenisei particularly, except for a large portion of the rugged Taimyr Peninsula, a veritable network of waterways, the highways of the nomadic inhabitants. For the snow-covered ice of the rivers and lakes is not only a guide for direction through an otherwise trackless wilderness but affords easy going for the reindeer. The lower Kotui to its junction with the Khatanga drains a region abounding in small lakes, forming a chain with Lake Yessei at its northeastern extremity. This lake is one of the landmarks of the somewhat indefinite boundary line

² See the note in *Geogr. Rev.* for February, 1917 (Vol. 3, pp. 151-152), and the references contained therein.—EDIT. NOTE.

between Yakut and Tungus territory. The Tungus hereabouts are called by the Russians Limpiisk Tungus and their land the Limpiisk Tundra, from the Limpa River.

The country to the east of the Yenisei is rugged, with elevations which in some places deserve the name of mountains. Even the so-called Big Low Tundra between the Pyasina and the estuary is for the most part a rolling moorland at an appreciable elevation above sea level. West of the river, and especially in the basin of the Taz, the land lies quite low. The extensive highlands between the headwaters of the Pyasina and the laeustrine region are usually known as the Syevernaya (Northern) Mountains.



FIG. 3—Yenisei-Ostyak fishing encampment on the Yenisei near Turukhansk.

The whole region is thus situated within the great lowland comprising that part of Siberia which lies between the Caspian and Aral basins and the lower Lena. The lowest portion of this, within Siberia proper, is the great marshland on the lower Irtysh and middle and lower Ob, extending north-eastward to the valley of the Taz. East of the Yenisei this region can only be characterized as a lowland by comparison with the great mountain-masses which form an almost unbroken chain, stretching in a great curve with a generally northeastwardly trend from Afghanistan to Bering Strait. The eastern portion of the Turukhansk District is an extensive plateau crossed by rugged chains of hills whose summits are from 500 to 1,500 feet above sea level. This is the rock- and lichen-tundra of Middendorff.³ In the valleys of the numerous streams strips of forest extend quite far north, dwindling in extent and in the size and height of the trees from a fairly normal growth and variety—larch and birch and pine—on the Lower Tunguska, to the straggling, stunted, almost limbless larches of the upper Khatanga and Kotui. About the estuary of the Yenisei the only wood is

³ A. T. von Middendorff: *Sibirische Reise*, 4 vols. and atlas, St. Petersburg, 1848-75.

driftwood—there is abundance of that brought down from the *taiga*, or forest region, far to the south; and the tundra here is lower, though by no means an undiversified level—Middendorff's moss, or *Polytrichum*, tundra.

CLIMATE

One might almost say that there are only two seasons in the northern Siberian year. In May the temperature rises abruptly; it falls with almost as great suddenness in September. At Golehikha, at the head of the estuary of the Yenisei, in $71^{\circ} 45' N.$, the sun for more than two of the three summer months is above the horizon. The change from winter to summer conditions is accomplished almost at a bound. In the middle of June the



FIG. 4—Skyline in the tundra near Golchikha. Reindeer of a Dolgan herd. (Photo from M. A. Czaplicka, Oxford.)

flats at the confluence of the little Golehikha with the Yenisei are still covered with snow, which also fills the gorges in the flanks of the low hills edging the tundra behind. It is the most desolate picture that can be imagined. The sun shines pallidly through the gray mist, which fails to conceal the brown crumbling hillsides that for nine long months have been mereifully hidden under a decent shroud of snow. The silence, broken only by the raucous tones of hovering gulls, is well suited to the place. One seems to have come upon an earth grown old and mouldered, dead beyond hope of awaking. In a few days you will be walking along those hillsides ankle-deep in flowers purple, blue, and gold, or wading across the flats from mound to mound of veritable garden-beds.

THE TUNDRA

On the banks of the river one does not speak of being in the tundra. This is a highway which connects the settler or transient voyager with a living world; to the nomad of the tundra, it is only a place to which one comes with nets to get supplies for the winter larder or to pay in labor some part of the debt which the trader will never wholly write off. To this class of sojourners upon the river the waste of waters in the great stream—six miles wide, a little below—shows no friendly, familiar face. When the

time to strike his tent comes he does not say, it is true, "I am going home," but "I am going to the tundra," which is, in effect, the same thing. Then he packs his tent and so much of his catch as the traders have left him, and his scanty household goods, upon two or three or half a dozen sledges, and, since snow has not yet fallen or at any rate is not yet deep, harnesses four or five reindeer to a sledge, instead of the winter team of two, and is whisked off over the low hills to the wide spaces where he can call his soul and his time his own.

The going is not hard. Even on the hilltops the earth is soft enough usually, and, where on the wide stretches of plain it is too soft for walking to be anything but a labor for humans, the light, broad-footed deer splash along at a quite respectable pace. The surface is a series of terraces, so to speak, at a higher or lower level, separated by low hills, or diversified by areas of uneven ground, a confusion of shallow valleys and rounded hillocks. Each terrace is at first to all appearances flat; but it grows marshier as you advance, and it soon becomes evident that you are in a sort of shallow basin, the rim of which forms the horizon on every side, shutting off the view of hills beyond. It is in a spot such as this that the illimitableness and monotony of the tundra come home to you. It is only on exposed hillsides or banks, on which the sun's rays fall almost perpendicularly, creating oases of warmth in the ice-chilled barrenness of the soil—for everywhere there is eternal ice from eighteen to thirty-six inches beneath the surface—that the bright blooms are spread to relieve the eye. Here there is nothing but the tussocks of brownish sour-grass and sphagnum moss and the dirty reddish brown water that can neither run off nor become absorbed in the thin layer of unfrozen mud. "No variety, no shadow, no night. Everywhere calm and silence. The whole summer through, the one long endless summer day broods over the far northern tundra, its light the pale gleam of a moonlike star veiled in mist."

Ground like this affords, of course, no substantial sustenance for man. Along the river from Yeniseisk as far north as old Turukhansk some of the more enterprising spirits among the settlers do succeed in raising scanty crops. Turnips, radishes, and cabbages can be coaxed into growing even near Turukhansk. Aside from the severity of the climate, the swampy character of the ground on the left side of the Yenisei and the stony barrenness of the right bank have to be reckoned with. As for the natives in their forests and heaths and moss pastures, they do not even make such use as they might of the limited resources that unassisted nature offers in this respect. The women and children gather, in a somewhat casual way, the cranberries and huckleberries which are fairly numerous in some parts of the region. These are eaten raw with milk—a royal treat, for the fawns take most of the scanty yield, and milk is very sparingly used for any human purpose. Or the berries are dried and mixed with "Tungus bread," the smoke-dried and pounded flesh of reindeer or of moose. Bark and roots



FIG. 5.



FIG. 6.

FIG. 5—Reindeer teams swimming a stream in the Big Low Tundra near the Arctic Coast. They are being towed by a man in a boat, not seen in the picture.

FIG. 6—Summer sledging in the tundra near Golchikha. The soft carpet of the moss tundra affords almost as good a surface in summer for sledging as does its snow cover in winter.

The man is a Samoyed. The long stick is the *horrei*, or goad. It is used not only to urge on the deer, but as an aid in guiding the team, which is controlled otherwise only by a single long rein attached to the headstall of the leader.



FIG. 7.



FIG. 8.

FIG. 7—Tungus boys: a summer *irgish* (trek). The weapon is the *arkas* or *palma*, used in clearing brushwood or blazing a trail in the forest. It is the old Tungus spear or halberd and is the only weapon with which the Tungus hunter will face a bear.

FIG. 8—Tungus pack train in the Limpiisk Tundra—the country between the Yenisei (north of the Lower Tunguska) and Lake Yessai. This is the home of the Limpiisk Tungus, an important group of the people of that stock who are found within the Yeniseisk Government.

are only eaten as a last resource, when the spring or autumn hunting has failed and famine threatens the owners of small herds of reindeer.

ARCTIC HYSTERIA

It has been observed by Schimper⁴ that the two most salient characteristics of the polar climate are temperature and illumination—the one as manifested in the long cold winter and the short cool summer, the other in the long winter night and the short summer day. His statement refers to the effects of the phenomena on the plant life of the Arctic. But there can be little question of the profound influence of these abnormal conditions, not merely on the physical but also on the mental constitution of people long subjected to them. Especially would this seem to be true of the periods of continuous daylight and of dark. Apart from the necessity of making the most of the long day, when it comes, for necessary tasks and thus shortening the hours of rest, there seems to be a kind of stimulation of the nervous system which urges one to a feverish and purposeless kind of activity. Russian settlers, especially newcomers, are more obviously affected in this way, but it is clearly perceptible also among the natives. The coming of the long, brooding winter night is followed by a kind of reaction, the effects of which are not always so obvious. There is no general depression of vitality apparent. Among the natives the dark midwinter with the necessary cessation of most kinds of activity is the special period for the making and returning of visits to distant friends and relatives; the tents are veritable hives of cheerful conversation and chaff. But none the less this is the time when the so-called “Arctic hysteria” is apt to show itself under circumstances tending to favor a lapse of self-control. This is the time when you are likely any night to be startled out of your sleep by the sudden bursting into song, plaintive and weird, of a sleeping Tungus tent-fellow. This will continue indefinitely if he is not awakened, and he will have then no recollection of his dream song. The Limpiisk Tungus do not recognize singing in one’s sleep as a sign of mental disorder, as they do some of the other forms of “Arctic hysteria”—classified by M. A. Czaplicka in “Aboriginal Siberia.”⁵ Such, for instance, is a form of hysterical seizure, for which they have a special name, in which the patient sings improvisations of his own which are likely to contain absurd exaggerations or laughable glorifications of himself. The last instance remembered in the Limpiisk Tundra was when there was an epidemic of this kind about ten years ago, following a famine, in which one of these megalomaniacs was killed by three fellow-tribesmen, themselves also apparently affected by the disorder, who resented his frenetic boastings, in which he represented himself as a god. The natives of northern Siberia, and especially those of more recent immigration, seem to be peculiarly susceptible to these expres-

⁴ A. F. W. Schimper: *Pflanzen-Geographie auf physiologischer Grundlage*, Jena, 1898, p. 698.

⁵ Oxford, 1914 (reviewed in *Geogr. Rev.*, Vol. 1, 1916, p. 161).

sions of emotional instability. Typical cases are rare among Europeans. It would seem that the older inhabitants of the region have had time to adapt themselves mentally, so that the abnormalities or extremes of the environment have become normal to them, while the Russians have not been subject to a sufficiently long accumulation of the peculiar influences to be so profoundly affected.

REINDEER HERDS

All the tribes are reindeer nomads. The Samoyed (Ostyak-Samoyed and Yurak) of the north are the oldest western exponents of this culture, as they are the oldest of the present inhabitants of the extreme north from the Taimyr Peninsula to Russian Lapland. The Dolgan, Yakutized Tungus, have thrust themselves northwestward into Samoyed territory near the right bank of the Yenisei, from the laeustrine country where the Yakut, pressing westward from the Vilui basin, are still crowding the Limpiisk Tungus on their eastward border. The Dolgan show their relatively late adoption of reindeer culture by the smallness of their herds and their habit of riding their reindeer, even where they are in closest contact with the Samoyed, who have not even a word for saddle and refer to the Dolgan double cushion somewhat sneeringly as "the sledge on the back."

It cannot, of course, be said that the domestication of reindeer is a necessary condition of survival in the Arctic, since, even in northern Siberia, there are tribes, or parts of tribes, which have no herds and manage without them apparently as well as the people of Arctic America. But it does seem at least that the maintenance of this culture, once adopted, is necessary to the survival of a group. It is the ravages of anthrax among their herds, at least as much as the evil influences of a closer contact with Russians than has fallen to the lot of the other tribes of the Turukhansk District, that is accountable for the degeneration and approaching extinction of the so-called Yenisei-Ostyak. It is the impoverished Samoyed, i. e. the man whose herd has so dwindled in numbers that it has become necessary for him to make the pursuit of fishing his chief employment, who, through the necessity of keeping close to the river, has fallen into the hands of the traders and sunk into peonage and alcoholism. Among the Limpiisk Tungus even, who are, except the Yakut and the Russians, the latest arrivals in the Arctic, the prime test of a man's social standing is the size of his herd. Very few of them have herds that will compare in numbers with the five or ten thousand deer of a wealthy Yurak. But a man whose not very remote forebears had no more than, say, ten or twenty deer and who was held in esteem principally for his prowess in hunting, if his herd does not considerably surpass the ancestral figure, is now spoken of with some accent of disparagement as a "fisherman": he is forced, that is, to keep ice holes open in river or lake throughout the winter in order that he may keep his larder supplied with the aid of gorge and lure. The larger the herd, the more draught or riding

animals are available and the more mobile, therefore, is the hunter; he can thus follow game far afield in a bad season and lay up for the dark mid-winter, when hunting is impossible, a good store of meat. In a society where the hardships of the struggle for existence are unmitigated by poor-laws, there is not much between the weakest and the wall.

CLOTHING

As the Samoyed (including the Yurak) have been longer in the Arctic than any of the other existing populations, except the vanishing Yenisei-Ostyak, it might be expected that the peculiar conditions would have left a deeper impress on their mental life than they have on that of their neighbors; and indeed much evidence in support of this conclusion might be adduced. So far as the more obvious aspects of the outer life of all these peoples is concerned, they are, broadly, very similar, in correspondence with the sameness of conditions throughout the Polar regions. The necessity for protection against the extreme cold—away from the coast and in the high-land valleys, which act, so to speak, as accumulators of cold air, over 100 degrees of frost being not unusual—has led to the contrivance of a sort of clothing which is extraordinarily well-suited to its purpose. The doubling of outer garments, coats and boots, usually of reindeer pelts, provides an insulating air space which keeps the cold out. Differences in the arrangement and decoration of these garments correspond to the tribe to which the wearer belongs. The Samoyed wears the inner of the two coats with the hairy side turned in, that of the outer, outwards; the Tungus vice versa, or the latter's hooded outer coat may be of hide without the hair.

METHODS OF TRAVEL

The sledge is another feature common to all these Arctic cultures. The type throughout this region is the light Samoyed sledge with high upcurving runners and a platform raised from two and a half to three feet above the ground. This is used both summer and winter by the Samoyed. Its use in summer would be impossible in the rugged, partially forested country of the Limpiisk Tungus. The use of sledges by the latter is indeed a recent innovation, which they say came in by borrowing from the Samoyed only three or four generations ago. Many Tungus still practice, even in winter, the "old-time *irgish*"—the pack-train of reindeer led by a mounted woman when moving camp. The old and the new mingle here; as likely as not the man precedes the column, traveling light in an unladen sledge. Snow-shoes are wooden, upturned in front, approximating the type of the ski, though much shorter and wider. The best are shod with reindeer skin.

Traveling in the Limpiisk Tundra is not so comfortable as it is farther north. There is a route to near Lake Yessei from Dudinka by which the Russian traders travel in great luxury. Their vehicle is the *balok*, a box-like canvas-covered fur-lined contrivance on runners, drawn by six or eight



FIG. 9.



FIG. 10.

FIG. 9—Lake Uchun, a mineral water lake in southern Siberia, south of Krasnoyarsk. Frequented as a *kur* by the Russian population. (Photo from M. A. Czaplicka, Oxford.)

FIG. 10—On the Yenisei between Krasnoyarsk and Minusinsk in the southern part of the Yeniseisk Government. This is the sort of country in which the ancestral stock of the Samoyed led the wandering life of hunters, before they were driven northward to face the still more rigorous conditions of the tundra. (Photo from M. A. Czaplicka, Oxford.)

deer. It carries a stove and can be made quite comfortable, no doubt, for one who is accustomed, as the trader is, to super-heated stuffy rooms. This route, too, is the one almost invariably used by these people and by officials, and along a part of its length there is a nondescript half-easte, more or less sedentary population, the offspring of exiles, criminal and other, and of the traders. Anyone who wishes to know the uncontaminated native will eschew the "comforts" of the northern route. The rocky tablelands and partly forested valleys of the Turukhansk-Yessei route are impassable to the heavy *balok*, and the light native sledge is the only satisfactory vehicle. So the Limpiisk people are comparatively free from undesirable visitors.

One keeps to the river valleys as much as possible. Here the snow is fairly deep, and the smooth motion of the sledge is liable to interruption only through a few trifling circumstances, such as the not infrequent tendency of a pair of deer to choose each its own side of a tree to pass on, with the resulting entanglement of antlers, traces, and other gear. Or you may come to a bit of treacherous ice underlain by rapids in the bed of the stream on whose frozen surface you are traveling, and run the risk of getting your feet wet—a serious matter in temperatures which have to be measured by spirit thermometers. But the valley trails are cushioned ease compared with the going on the stretches of bare rock-tundra plateau which often have to be crossed. The precipitation of snow in this country is small, and the fierce winds which sweep the bleak highlands do not let much of it lie. Your sledge progresses in a series of leaps and bounds from one miniature boulder to another, and you spend your hours in a sort of dull aching wonder as to which will go to pieces first, your own racked skeletal framework or that of your sledge. Where a number of people travel in company the usual procedure is to rope several sledges, each with its team of two reindeer, together, while the man who knows the country best acts as driver of the train. In going down the precipitous slopes which form the approaches to the plateaus no one thinks of getting off his sledge. You go from top to bottom in a series of breathless rushes, checked only by a projecting ledge or boulder which brings you up with a round turn, the runners of your sledge on top of the sledge in front, your team of reindeer fairly underneath you, or at luckiest, sprawled kicking and panting with terror on each side. Fortunately the traces are long, and the sledges light, or the teams of a train would be practically exterminated whenever such an escarpment has to be descended.

DWELLINGS

The necessities of a wandering life require a light, portable dwelling. The *chum*, or tepee, is essentially the same throughout: of reindeer skin, usually, though the Yenisei-Ostyak make their summer tent cover of birch bark. The *golomo*, or conical tent-shaped log hut of the Limpiisk Tundra, is a mere translation of the skin tent into logs. *Golomos*, or, more rarely,

rectangular *balagans* copied from the Russian settlers' shacks on the river, are occupied during two or three months of the winter by some of the wealthier Tungus and Yakut of the forest border. The *golomo* may have sometimes a backed open hearth below the smoke hole. The backing con-



FIG. 11—A Tungus shaman in ceremonial dress.

sists of clay-plastered logs leading up through the smoke hole. Against these, burning logs are set on end. The smoke rises better, and the wide, approximately upright surface of the glowing or flaming wood distributes the heat more effectively than the horizontally laid fire of the ordinary box hearth. In *balagan* and *golomo* the chinks between the logs are stopped with moss and earth. Snow is thrown on so as to cover the whole. With the first sunny days of any length these dwellings become uninhabitable. The Tungus sybarite returns to his *chum*.

NATIVE TRIBES OF THE REGION

Of the present native inhabitants the vanishing Yenisei-Ostyak have been longer on the river than anyone else. Originally they were neighbors, though of very different origin, to the Samoyed in the mountains of the south—the Altai and the Sayan. Hundreds of long Siberian miles, the Yenisei- and Ugrian-Ostyak, and several mixed Turkic tribes now separate the Samoyed from the remnants of their ancestral stock in the south—the Kamasintz of the Sayan foothills and neighboring steppes.⁶ Like the other inhabitants of the northern region they now occupy, they have been driven thither by the pressure of the restless Turki and Mongols in the south. Long as their residence in the Arctic has been, it would seem that both they and the other immigrants have retained many of the qualities of mind and temper which they developed in other surroundings. How else account for the different manner in which they and, say, the Tungus respond, in this inner sphere, to the same environment?

THE TUNGUS

The Tungus is a practical person, unemotional, cheerful, with a slightly cynical outlook upon life. He believes implicitly in his shaman, it is true, but he attends to the things of the spirit to which the shaman ministers chiefly when some immediate practical need arises, some immediately personal crisis. The phenomena associated with illumination which are so impressive in the north do not appear to affect him greatly. Ask him what name he gives to the flickering fingers of the northern lights that beckon in the sky above him. He cocks a casual eye at the display and answers without interest: "It burns." The return of daylight is not welcomed by any ceremony. His first recognition of the participation of any power outside himself in the changes of the year will be, perhaps, a private visit to a shaman to get him to dedicate to the great god of good luck, the "owner" of all wild reindeer, the charm by which he hopes to procure himself a good season's hunting. Or, at most, there will be some quite local shamanizing at the first bit of open water to appear in which fishing is practicable.

To maintain a cheerful spirit in the face of the bleak dreariness of the north is apparently a principal condition on which man can endure its rigors. At any rate a disposition to enjoy whole-heartedly what simple pleasures life affords is everywhere apparent. The Tungus advise the alien wayfarer in the tundra to eat much and laugh often, and with both Tungus and Samoyed this is not less a matter of practice than of precept. But the Samoyed is a much more emotional person. It is impossible to think of a dignified Tungus pater familias watering his pannikin of tea with salt tears as he listens to a phonograph reproducing the dirge for the dead wife of his

⁶ Recent investigations tend to throw doubt on the conclusion reached by Castrén that this region of the Sayan Mountains was the original home of the Samoyedic stock. In any case, however, they are Neo-Siberians of southern origin—southern, that is, in relation to their present habitat.

youth which he sang beside her grave thirty years ago and repeated just now by request into the wonder-working machine in expectation of the cheering cup. The story-tellers vie with one another in relating the prodigies performed by heroes or heroines in pursuit of the objects of their passion. The change of season, the return of the friendly sun, is the occasion for the most elaborate of their ceremonies, to take part in which numbers of people travel great distances, suspending for the time being even the strict rule which forbids a woman to ride on a man's sledge. The grim aspects of the Polar environment, the deeper, longer darkness of the still farther north, have sunk into their souls. After the Yurak spring festival of the changing of the sledges of the gods, the old abandoned vehicle shrines are left on a hill, the runners pointing north towards the land of darkness and evil, of desolation and of things forgotten, and the new sledges with the rejuvenated gods in their places are headed south, where dwell the powers of light and good, and where the sun, describing his low arc, brings promise of a lengthening day.



FIG. 12—A Limpiisk Tungus of the Hukachar clan, showing *raasya* (fillet of squirrel tails) worn by married women.

THE YAKUT

Latest comers of all into the Arctic are the Yakut, a Turkic tribe, pushed northwards first by the Mongolic Buryat and more lately driven still farther north by the Russians, with whom in the seventeenth century they fought a notable fight. Their old occupation as herders of cattle they have not given up even on the miserable swampy pastures of the Vilui. Pushing hence northwestward toward the Limpiisk Tundra, they have already displaced and sent still farther north to press upon the Samoyed near the right bank of the Yenisei a group of Tungus, partly Yakutized in a physical sense, wholly so in their language, the Dolgan. On the eastern border of

the Limpiisk Tundra, the Yakut have perforce abandoned the keeping of cattle and become deerherds like their Tungus neighbors. They do not confine themselves to this, however, and their herds are small. The headwaters of the Vilui are not far, as distances in the tundra go, from Lake Yessei, the eastward limit of Tungus wanderings in this part of the region. On the Vilui are other Yakut, and the river is a highway to the southeast where the Russians are settled on the Lena and where articles which prosperous Tungus herders desire may be obtained. This is the eanny Yakut's opportunity. He becomes a trader and acquires much more wealth than his brothers on the Vilui with their half-starved little herds of cattle. To the Tungus both as producer (of furs and skins) and consumer (of tea, tobacco, rye meal, etc.) he is middleman and earns not a little of the unpopularity which often goes with this calling. It is the only instance in the northern Turukhansk District of the influence of a physical feature in causing a noticeable differentiation of existing cultures, and it affects only a small group. Elsewhere the general sameness of conditions allows no scope for anything of the kind.

NOMADISM AND TRIBAL RELATIONS

A true coast culture of fishermen or sea-hunters is not found within this region. The few people who frequent the coast proper of the Arctic retain their reindeer and do not usually remain near the sea in winter. In the tundra there are no barriers for people once acclimated to its hard conditions. The limits of the wanderings of a tribe are a matter of agreement with its neighbors (an agreement now given the character of law by Russian sanction or regulation) and the possession of the means of travel. The possession of reindeer implies this of necessity. Even a small herd soon consumes the moss in any particular locality. When the bucks begin to stray, the herdsman knows that it is time to strike camp and follow the herd to new pastures. It is not a matter of seasonal nomadism like that of the horse nomads in the south; the reindeer-breeder's wanderings have no periodicity; they depend, within the limits of the tribal territory, on the size and appetite of his herd.

The complete absence of any bond of attachment to the soil, this free-wandering mobility of all the tribes, the sameness of conditions under which life must be lived, all the circumstances tend to a general leveling and unifying of the Arctic cultures. Yet, under the obvious surface resemblances there still survive the peculiarities of belief and of social observances which long ago differentiated the various stocks of which the present population is made up. And there are evidences of an instinctive determination among the tribes to keep themselves distinct, as well as of the inevitable merging of their cultures into one another. The elaborate terminology of the chief industry, reindeer-breeding, which must have spread from a common center—the Limpiisk Tungus acknowledge their indebtedness to

the Samoyed in this matter—is distinct in every group. The original exogamous social organization of the Tungus has been converted by the necessities of their present life, which has led to the scattering of the original groups over great distances, into the practice of intermarriage within the group or, on their borders, of an extra-tribal unregulated intermarriage; but the old clan names persist. So, too, do the old inter-tribal jealousies in spite of the establishment of a Russian peace. It will require a whole day's session of the yearly *munyak* and all the strenuous effort of a pro-Yakut Tungus “prince” to compose a dispute on a point of etiquette between a Yessei Yakut and a Limpiisk Tungus. Rival Samoyed and Yakut shamans pursue their quarrels beyond the grave; the victor in the struggle on this plane of life does not escape the posthumous enmity of his apparently beaten antagonist. A Tungus shaman sends a familiar grown mischievous to his own people to exhaust his malice upon the alien Samoyed. Like surroundings and like interests in the struggle for existence may do much towards the fusing of cultures and stocks, but the inveterate distinctions of belief and usage die hard.

DONGOLA PROVINCE OF THE ANGLO-EGYPTIAN SUDAN

By LOUIS C. WEST

Dongola Province, the most northern but one of the administrative divisions of the Anglo-Egyptian Sudan, lies between the parallels of $16^{\circ} 0'$ and $19^{\circ} 40'$ N. west of an irregular line in about $32^{\circ} 30'$ E. (Fig. 1). Essentially, however, it comprises the Nile Valley from the Third Cataract to the Fourth Cataract, both of which, except for a few months each year when the Nile reaches the highest point of its annual rise, effectively bar river navigation. There are at present two practicable ways by which the traveler may enter the province. The first and easiest is by the branch railroad which extends to Karcima at the foot of the Fourth Cataract from Abu Hamed, which has rail connections with Egypt, Khartum, and the Red Sea ports of Port Sudan and Suakin. The other available route is by camel or horse from Wadi Halfa at the foot of the Second Cataract through the Batn el Hagar to Kerma at the head of the Third Cataract. This is the historic trade route into the Sudan which we know was in use as early as the Sixth Egyptian Dynasty, some 4,500 years ago.

On the rocks which face the river at Tombos, six or seven miles from Kerma, are the well-known inscriptions carved by the generals of Thothmes I to record the fact that his armies had reached the fertile plain of Dongola and that his empire stretched from this point to the Euphrates. During the war with the Mahdi and his successor the Khalifa, the English built a railroad for military purposes from Wadi Halfa to Kerma; but service over this was discontinued some seven or eight years ago, and the rails were in large part removed. The reason given was that the sharp gradients on the line made its operation unprofitable; the real reason seems to have been an effort to force the province to use the railroad at the southern end of the district and in this way to come into closer economic touch with the rest of the Sudan. So far this effort has been a failure: the profitable export business with Egypt which might have been easily developed has been crippled and no corresponding gain made in the amount of trade with Khartum. That such efforts forcibly to divert the direction of a country's trade are unscientific is shown by the long lines of camels which daily cross the dismantled railroad line near Kerma on their way to and from Wadi Halfa.

SOIL AND AGRICULTURE

With a more industrious population Dongola would be a land of amazing prosperity. Its soil is said to be the most fertile in the Sudan, but as a result of universal disease, of successive low Nile floods, and of a generally indolent population there is only a narrow strip of cultivation along the river. From Kareima to Ambigol the land on both sides of the river is

cultivated; from Ambigol to Dongola one or the other bank is cultivated, but rarely both. In favorable years the district between Kareima and Ambigol may be compared with the Fayum rather than with any other part of Egypt south of Cairo. In the winter of 1913-14, however, the province was suffering from the effects of an unusually low Nile. In many places the river was flowing between banks that were absolutely barren except for the

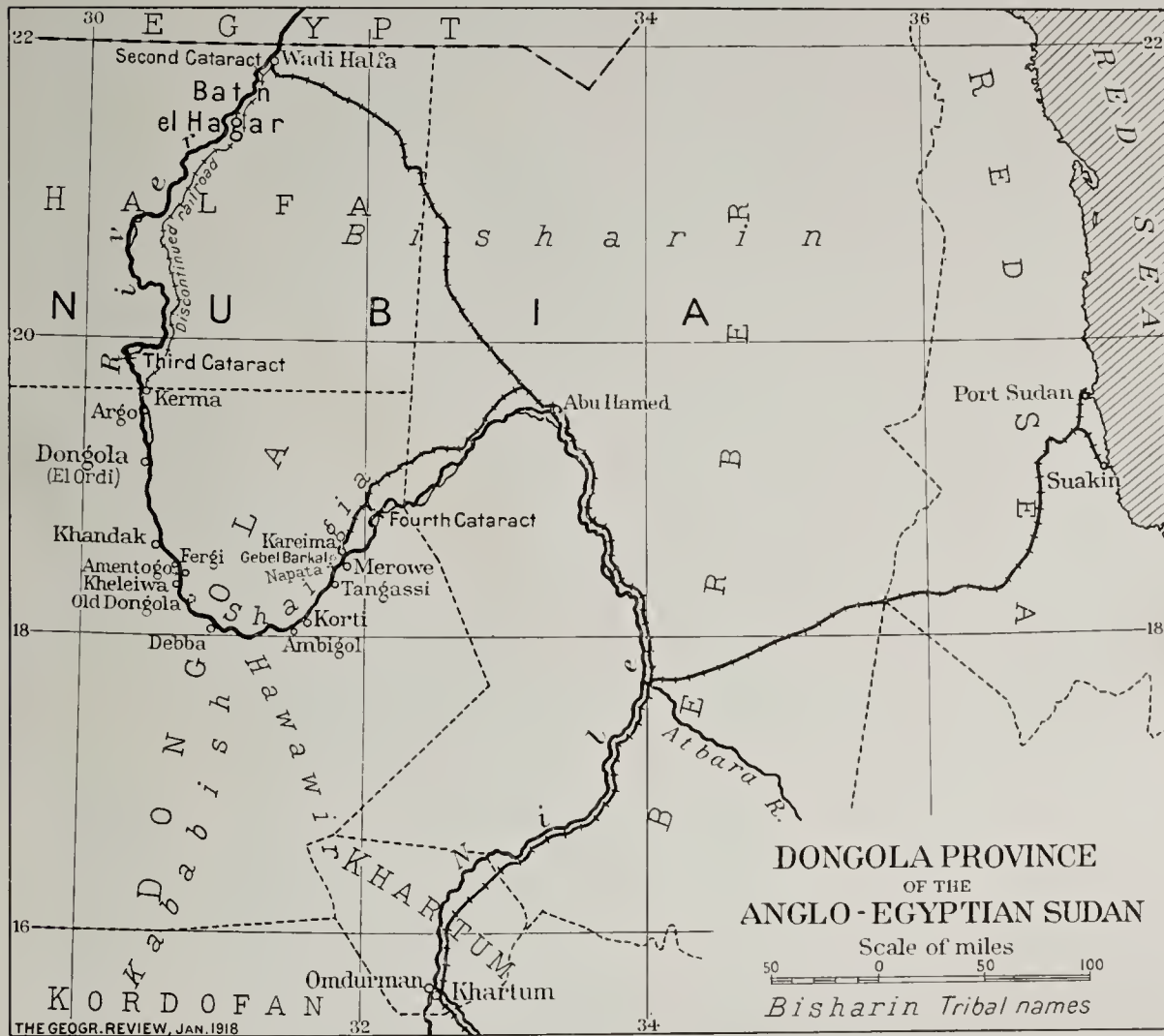


FIG. 1—Sketch map of Dongola Province and other parts of the northern Anglo-Egyptian Sudan. Scale, 1:7,400,000.

thorn bush; at other places the strip of cultivation varied in width from a few yards to a mile, seldom if ever within the limits of the province exceeding the latter width.

The main crops are durra, wheat, *simsim*, barley, and dates. In a favorable year three crops of cereals may be grown, two for example of the fast-ripening durra and one of the slower wheat or barley. The dates are both plentiful and excellent, forming the chief article of export. Some senna grows wild and is sent to Assuan or Kordofan. The people do not realize the possibilities of their land and probably never will until they are replaced by skilled industrious workmen such as the *fellahin* of Egypt.



FIG. 2—Group of Dongolawi women.

Several varieties of native vegetables are grown, and occasionally one will find a patch of watermelon. Potatoes are altogether lacking, as are fruits. There is but one orange grove in the district and that is in the garden of the English governor at Merowe. So far little effort has been made to grow cotton, a crop the government is making every effort to advance in the country nearer Khartum.

ANIMAL LIFE

Of wild animals the province has the addax, a rare species of antelope; a handsome gray fox with large ears and tail; and the ever fascinating gazelle. The pariah dog of the province, an animal half wild and half tame, is a small greyhound, altogether unlike the mongrel seen in Egypt. In certain parts of the river crocodile abound, while on the desert one occasionally sees the warena, the so-called land crocodile, but in reality a large lizard. Chameleons are often seen, particularly on the walls of houses when they are stalking flies. Unlike the familiar reptile sold by our street fakers, these chameleons are sometimes three or four inches in height. They look extremely formidable but in reality are harmless, their only weapons of offense or defense being their power to change color and their long sticky tongue.

Camels are extremely numerous and of a good quality. Their hair is a recognized article of commerce and is woven into various articles for household use, but not, I believe, into articles for personal wear. Camel-hair runners, 20 inches wide and 9 or 10 feet in length, are sold by the weavers, who furnish all their material, for about 50 cents, or the equivalent of three days' pay of an ordinary laborer.

Some twenty years ago the breeding of the small active Dongolawi horse was a flourishing industry, but at present this seems totally abandoned; horses in fact are seldom used by the native population. Donkeys are everywhere; the majority as despondent-looking and as ill-treated as they are elsewhere in the East, while a few are of great size and strength. There are also countless goats, some cattle, and a few oxen. The cattle are largely used to drive the *sakiyehs* (water wheels) and are only rarely killed for food. What the goats find to live on is one of the great mysteries of the Sudan. Every morning they are driven out on the desert to be brought back only at sunset. Always emaciated and hungry-looking, they still manage to exist, feeding mainly on the tiny leaves of the desert thorn bush, and to yield their owners a thin ill-tasting milk. Every family has its flock of fowls, each one a little tougher and a little less palatable than the others. Eggs could be bought in the winter of 1913-14 for about five cents a dozen, while live sheep sold for 60 cents to \$1.50 apiece.

Of less agreeable "animals," the scorpion, nimetta, and white ant hold first place. The nimetta, a very small fly, infests the region from Delgo to Korti during the winter season, November to April. These pests fly in

dense clouds, and the countless bites which they inflict bring on an extreme irritation often resulting in a slight fever. The nimetta is disliked, not because of any danger from fever that may arise from his bites, but simply because of the discomfort he causes. He finds his way into one's hair, ears, nostrils, mouth, and at times becomes absolutely unbearable, neither the face veils worn by the Europeans nor the smudges carried by the natives being of any effect. The only thing to do is to keep moving. Fortunately the nimetta is active only in the daytime and then only when the wind is comparatively quiet. The white ant is not common. Rarely one will see a beam of wood eaten through and through until hardly more than the shell of paint remains; but, as thorough painting prevents its ravages, this insect is not greatly to be feared.

SCENERY AND MIRAGES

For agricultural purposes, the almost negligible rainfall is of no value. The farms are irrigated almost without exception by water taken from the river by means of the *sakiyeh*, or water wheel (Fig. 3). Traveling along the river one passes a constant succession of *sakiyeh* pits with their grass screens, their crude creaking wooden wheels, their dripping earthen pots fastened to the revolving rope, their blindfolded bullocks or cows urged on by little boys or girls. The *shaduf*, or water sweep, so common in Egypt, is apparently not used in the province; none at least was seen there during a five months' residence.

There is little of interest in the landscape with the exception of the daily mirages and the wonderful color effects of the sunset. Beyond the narrow strip of cultivation, vivid in its green, and with its tall waving palm trees, there is only the desert with its yellow sand, its thorns and acacias, and its dazzling sunlight. At places hills and peaks rising abruptly out of the desert give variety and a certain charm to the view. The mirages are at first of great interest. Standing on the desert in the middle of the day one appears to be in the center of an island, so perfect is the resemblance of the mirage to water; yet as one advances the "devil's river," as the natives call it, constantly recedes in the distance.

There are two kinds of mirages, the so-called sky mirage and the so-called ground mirage. Both are caused in the same way: by the superposition of two layers of air of such difference in specific gravity or density that their plane of contact forms a reflecting surface. When this reflecting surface is below the level of one's eye, as it practically always is, we have a ground mirage. Here one sees nothing but the reflection of the sky, which, by making the reflecting surface appear blue, gives it a perfect resemblance to water. This resemblance is increased by the effect of the wind, which causes waves, and by trees or other objects which may project through the reflecting surface of the mirage and cast their shadows upon it. Occasionally one will see a string of camels, or a line of walking men with their legs

completely hidden below the reflecting surface and looking for all the world as if they were wading through a shallow lake.

When the reflecting surface happens to be above the level of one's eye, we have a sky mirage. In this is seen nothing but the reflection of objects actually on the earth, these objects of course appearing upside down. The



FIG. 3—A Dongolawi *sakiych*, or water wheel. (Photo copyright by G. N. Morhig, Khartum.)

effect on a small scale may be obtained by holding a mirror above one's head and watching the reflection of objects on the floor. No man ever saw in a sky mirage the reflection of an oasis with the palms standing right side up. Such a thing is optically impossible; just as much so as would be the reflection of some object not actually in existence on the earth.

THE INHABITANTS

The main interest of the country is not in the scenery but in the people. The agricultural population on the river banks forms physically as well as geographically the link between the true negro to the south and the Egyptian to the north. Ethnologically these people may be classed as Nubas or Barabra. They are smaller and darker than the Egyptian, but still not black, even though many of them have the short kinky hair of the negro.

Less negroid in appearance are the two nomadic types one meets in the province: the nomads who live along the river banks and those who live out in the desert. The former are known as Gararish while the desert tribes are Bisharin, Hawawir, Kababish, and Shaigia. Though Arabic is generally

spoken by these people it is not their native tongue. From Wadi Halfa to Kerma the people speak a Nuba dialect known as Mahasi; from Kerma to about Kareima, a dialect known as Dongolawi.

Owing to the extensive slave trade formerly carried on in the district



FIG. 4—Entrance to a courtyard of a native house near Kerma. The plates over the door are supposed to bring good luck.

and to the great number of slaves still there, the population contains many pure negroes and half-blooded negroes. In addition there are a few Turks, a few Greeks, a few Egyptians, and possibly a few true Arabs. Every free man in the province claims to be a full-blooded Arab himself, but this claim has no basis in fact. The Arabs, it is true, dominate the northern Sudan and do this without having exterminated the former inhabitants or even having entirely supplanted the native dialects. Contrary to their usual custom they intermarried freely with the natives in former times and have so impressed their religious ideas and political theories upon the people that many of the

native customs have entirely disappeared and others, like the local dialects, are being gradually stamped out.

DRESS

Having crossed the desert that separates Abu Hamed from Wadi Halfa, the traveler notices at once differences in the native customs as compared with those of Egypt. For one thing, the face veil is generally absent and the women seldom cover their faces at the approach of men. Then there is the general use of white clothing by the men in place of the black almost universally worn by the peasants in Egypt. South of Khartum dress is still largely a matter of ornament, but in Dongola, despite the great heat, the people dress in about the same way as in Egypt. The peasant woman, like the man, wears a pair of drawers resembling the lower half of a suit of pajamas but fitting tightly just below the knee. Over this a sheet of cotton is fastened around the waist so as to form a kind of skirt. Usually there is another sheet fastened around the shoulders so as to form a blouse, but this is often omitted. The Egyptian woman, if she is of the peasant class,

always has her upper garment so arranged that she can pull it across her face on the approach of a strange man. The upper part of her body and the back of her head are always covered; and, if she happens to be a woman of position, her arms and hands are never left bare. Such niceties of dress and etiquette are altogether unknown, or at least are not practiced, by the Dongolawi woman.

The essential part of a young girl's dress is a short skirt made of many leather thongs, 10 or 12 inches long, tied to a cord which is fastened around the waist. Over this a skirt may or may not be worn, as the fancy of the wearer dictates. Boys of the same age wear simply a loin cloth. Very little girls and boys run naked, their only ornament being a bracelet or a charm hung around the neck, by means of which disease and particularly the evil eye may be averted.

Unmarried girls wear the hair braided into hundreds of tiny plaits, exactly in the fashion which ancient cemeteries show was followed 4,000 years ago (Fig. 5). The women, both married and unmarried, use hair oil in abundance, so much of it in fact that often in the hot sun one will see it dripping onto their shoulders. All are equally fond of jewelry: necklaces of gold, amber, or glass beads; earrings, nose rings, finger rings, bracelets, and anklets of gold, silver, brass, or ivory. Shells or bright glass beads are often tied to the hair, while on the forehead a large flat ring may be worn. Without exception, the men wear small leather charms tied to the arm or round the neck. These, to be efficacious, contain small pieces of paper covered with magical verses. The people believe that though one such charm is a protection still no harm can come from wearing more, and often a man will have from ten to fifteen fastened to his body.



FIG. 5—In the market at Kerma. Hair plaits such as those worn by the girl were in use 4,000 years ago.

THE LIFE OF THE PEOPLE

Despite the general disinclination to work, the people make, if sufficiently urged, efficient laborers. Their skill and ingenuity in mechanical lines is amply shown by their handsome, highly colored baskets, their well-known *damur* cloth, and their tasteful jewelry. Men have been known to walk

200 miles for a chance to earn 15 cents a day, but this is only under the urgings of great need. One man, when asked why he had given up a place where he was making 17½ cents a day, as much if not more than he had ever earned before, replied that he could not live on that money and so was doing nothing. Almost without exception a man will work only until he has saved enough to permit his loafing for a few days; then, when his money is gone, he will seek work again, and the process is repeated. On 15 cents a day a man can raise and support a family, and the great bulk of the people are living on practically this amount. It is just enough to support life; needless to say there is no opportunity to buy anything but the bare necessities, no chance to save against a low Nile and the resultant partial or complete failure of the crops. During the year 1913-14 the northern Sudan passed through a period of famine. The suffering can be better imagined than described. Not only cattle but human beings died of hunger. In such a time the bad traits of a people all come to the surface. Many of the able-bodied men went elsewhere, leaving their wives and children to get along as they could. Some of these men, but apparently only a few, sent part of their earnings home; the rest seemingly forgot they had any family obligations. The few who had grain kept it. Unlike the fortunate in Egypt, they refused to share with those who were hungry. Many even refused to sell, despite the high prices they were offered, believing they could make still more by holding their grain until it could be sold as seed at the next high Nile. The government did what it could. Emergency relief work was started on which a man or woman could make 7½ to 10 cents a day; grain was imported and sold at cost or even given away. But despite utmost efforts, the women and children, who enlisted special sympathy, proved hardest to provide for and consequently suffered most. Even when crops are good the poorer people are barely able to get along; one young boy was heard to say that he had never had enough to eat, and that everyone was always a "little hungry."

The Sudan is one of the few countries where slavery is still legally recognized. The slave trade, it is true, was abolished after the downfall of the Khalifa and certain regulations enacted by which the condition of the slave was bettered. But as long as the rule remains that every child of a slave mother is a slave, there can be no great decrease in their numbers. Apart from the fact that his freedom of action is necessarily limited, the slave calls for no pity. Outwardly there is nothing by which he can be distinguished from his owner, and the general standard of living is so low that even in this respect he is little worse off than the free man. As a general thing a slave is kept busy on his owner's field, but often he is allowed to go away, or he is sent away, to seek more profitable work. Under such circumstances he is allowed to keep a part of his earnings, sometimes half, sometimes more.

As in Egypt, girls are married at an extremely early age. In the selec-

tion of their husbands their inclinations or desires have little if any weight. Matchmaking is altogether the business of the parents or guardians, and it is the boy whose family is prepared to pay most that has first choice. As among the peasants in Egypt, a cow, a buffalo, or its equivalent is usually the price paid to the girl's father. When we remember that a woman is a worker and an active producer it does not seem illogical that the father should be recompensed for the economic loss he suffers when a female member of his family departs. Although every family desires its first child to be a boy, perhaps the majority want a girl as the second. As one father said, a boy costs money, but a girl brings it in. The greater the number of children in a family, the more pleased are both the father and the mother. One man who was said to have eighteen sons was the envy of the surrounding country, but families of this size are rare.

EDUCATION

A vast majority of the population in Dongola Province can neither read nor write. Even if there were any interest in affairs outside of the village, the cost of the cheapest newspaper would be beyond all but the favored few. There are a few boys' schools in the province, but so far their benefits are limited to the families who live in the immediate neighborhood and who at the same time are able to bear the financial loss arising from the boys' absence from work. These schools are under the government ministry of education, are visited at least once a year by government inspectors (Englishmen), and on the whole are doing splendid work. The character of the teaching may be inferred from the fact that the "higher mathematics" given in Gordon College, the head of the educational system, is about equivalent to the mathematics given in one of our better high schools. There is, however, a constantly increasing desire on the part of the people for an education. A striking example of this may be seen in the case of an Egyptian army officer who was stationed as *mamur*, or mayor, of the district of Argo. He was resigning his position and his chance of a pension so as to be able to take his daughter to Cairo for her education. Some time previously he had obtained special permission for her to attend the local boys' school but was dissatisfied with that. He himself was a good example of the better-class Egyptian. His army record was good, his administrative efficiency as *mamur* was beyond serious criticism. He spoke Arabic, French, and English. In conversation one day he brought up the subject of America. To explain some statement he was trying to make he drew a map of the Mediterranean, of England, and America. The United States appeared as a small island, with New York on the western side. That American farmers had no occasion to irrigate, as the country had enough rain for all agricultural purposes, seemed especially remarkable to him, as indeed it did to every native. A word picture of the Woolworth Building he absolutely refused to believe.



FIG. 6.



FIG. 7.

FIG. 6—A small store in the desert.

FIG. 7—A typical Dongolawi house.



FIG. 8.



FIG. 9.

FIG. 8—A sheikh's tomb near Kerma, built of mud brick.
FIG. 9—A ruined mud brick temple dating from 2000 B. C.

A TRIP DOWN THE RIVER

Three days are necessary for the trip down stream from Kareima to Kerma, a distance of about 200 miles. For the return trip, up stream, the little steamer takes five days, making on the average 40 miles a day and tying up for the night. The word hurry and the necessity for it are both unknown in the province.

Leaving Kareima the first sight of interest is Gebel Barkal. At the foot of this "Sacred Mount" is the cemetery of the ancient city of Napata, which



FIG. 10—Date palms growing through the drifting sand.

lay directly opposite on the west bank of the river. Napata was the home of the Ethiopian kings who in the eighth century B. C. conquered Egypt and held it for about two generations, when they were finally driven out by the Assyrians. In imitation of the Old Kingdom in Egypt, the people of Napata erected little pyramids over the bodies of their dead kings. Eight or nine of these are still standing in a good state of preservation. They vary in height from 40 to 60 feet, being far smaller than their enormous prototypes at Gizeh, the two largest of which tower 450 feet in the air.

About four miles beyond Gebel Barkal is the town of Merowe, the residence of the English governor of the province. The town is new, with wide streets lined with shade trees and with handsome red and white houses, built for the use of various government officials. Just beyond Merowe is Tangassi, whose market is known throughout the Sudan, being exceeded in size only by that of Omdurman. At Debba, some distance farther down

stream, the river makes a gigantic bend to the north. From beyond Kareima it had been flowing toward the southwest but it now definitely turns toward the Mediterranean, flowing northward from here with hardly a bend of any great size. In the famine of the winter of 1913-14 Debba was the center of the stricken district of the province. As the steamer pulled up to the bank, crowds of women and children came running down to the landing place to meet it. The picture they presented was one that no one wishes to see twice. As we walked ashore every hand was stretched out for gifts, but not a person, old or young, made any audible plea for money. No words could have made so powerful an appeal as the mere presence of those shrunken, shrivelled forms. At the sight of money a perfect riot broke out. One man, thoughtlessly giving away small coins, was in an instant the center of a howling mob from which it took three policemen to rescue him.

Formerly Debba was a town of considerable importance. Here the ivory and gum traders bringing their wares from Kordofan and Darfur exchanged them for European goods. At present its chief importance arises from the fact that it is the farthest point regularly reached by the sailing boats from the northern end of the province. As is the case in Egypt, Dongola Province has an almost constant north wind. This carries laden sail boats as far as Debba easily and quickly, but owing to the great bend in the river here, one finds if he tries to proceed farther that the north wind which so far has been a following wind is now a head wind. Articles could be sent from Dongola to the railroad by the government steamer, but to save money the native merchants usually send their freight by native sail boat to Debba, where it is transshipped to the steamer for the rest of the trip.

OLD AND NEW DONGOLA

A short distance from Debba is Old Dongola, now altogether deserted, but once the capital of a Christian empire which flourished here during the sixth century. The floor of the old church is still to be found under the mosque built by the Arab conquerors to replace it. Close by are the remains of a large fort, around which lie the tumbled ruins of the mud brick houses of the old inhabitants.

Christian remains are found at many places in the province, at Khandak, Fergi, Kheleiwa, and Amentogo. Directly above the landing place at Khandak is a large imposing mud brick fort. To judge from the potsherds which lie under foot, this structure was first built in early Christian times and then rebuilt and re-used at a much later date. Khandak itself is a town of no great interest, its chief importance in the eyes of the traveler being its manufacture of the highly colored baskets which are offered for sale here.

Dongola, or El Ordi, as it is known to the natives, is situated about 40 miles beyond Khandak. It is the largest village in the province, containing sixty or seventy permanent shops, four or five mills for grinding grain, a



FIG. 11.



FIG. 12.

FIG. 11—Typical view of an Upper Nile cataract. (Photo copyright by G. N. Morhig, Khartum.)
 FIG. 12—A boy using a reed canoe in the rapids at Tombos.

small hospital, a doctor, and three English officials—half of the entire white population of the province. The last telegraph station in the province is located at Argo, about 30 miles north of Dongola, while Kerma, some 8 miles farther, is the last station reached by the government steamer. Owing to the dangerous channel the boat can only reach Kerma during three or four months a year; for the rest of the time it stops at Dongola or Argo, as the state of the water or the whim of the engineer dictates.

ANTIQUITIES

Near Argo is a ruined temple, next to the Napata remains the best known antiquity in the province. The plan of the building can hardly be made out, no trace of the walls appearing above the mounds of rubbish and debris which now cover the site. At either side, however, of what was once the main entrance lie two colossal statues of some unknown king; while in the courtyard is standing the famous headless statue of Sebekhotep, a king of the Thirteenth Egyptian Dynasty, who reigned about 2,000 years before Christ. At Kerma are the interesting cemeteries described in the *Bulletin of the Boston Museum of Fine Arts* for April, 1914, while just beyond, at Tombos, on the rocks which overlook the cataracts there, are the stelae erected by Thothmes I.

This list of antiquities, while interesting to a few, is not such as will tempt the traveler any farther from the railroad than Gebel Barkal. But for those interested in getting away from the crowds of tourists who infest Egypt, no more interesting trip could be planned than one by horse or camel from Wadi Halfa to Kerma through the wild beauties of the Batn el Hagar and thence by steamer to the railroad at Kareima. The country is absolutely new as far as tourists are concerned, in the winter of 1913-14 but two persons other than government officials and a Cairo-Khartum aviator visiting the northern end of the province.

A NATURALISTIC MODEL OF KILAUEA VOLCANO, HAWAII*

By ROBERT W. SAYLES

Curator, Geological Section of the Harvard University Museum

There has recently been placed on exhibition in the Geological Section of the Harvard University Museum a large and remarkably naturalistic model of Kilauea, the active crater on the eastern slope of Mauna Loa, the great volcano on the island of Hawaii. It is the work of Mr. George Carroll Curtis of Boston and embodies the ripe fruition of his many years of effort in the production of relief models that are true to nature. In some respects a study of this model will give to the student a clearer understanding of the great crater than he could obtain from pictures, descriptions, or even a visit to Kilauea itself.

The work on the model was begun in March, 1913. Mr. Curtis went to Hawaii and spent three months at the crater, making a careful photographic survey, supplemented by elaborate field notes, color sketches, and detail drawings.¹ Mr. F. W. Haworth devoted several months to the making of a series of aerial photographs of Kilauea from kites half a mile or more above the ground. The working up of the material gathered and the execution of the model consumed forty months in all.

The model, which is of circular form, with a diameter of fourteen feet, is on the scale of 1:1,500, or 125 feet to the inch. The underlying conception of the model implies that there is no vertical exaggeration. The extensive encircling cliff around the lava "sink" has, in the model, a height of from two to six inches, while the great caldera measures about ten feet across. The purely mechanical work of building up the raised map which forms the basis of the model took six months and the coloring about the same length of time. The incorporation of the vast amount of detail from photographic records, sketches, and field notes consumed the remainder of four years of careful personal work.

* The writer wishes to express his appreciation of the valuable assistance rendered Mr. Curtis in his preliminary work while at Kilauea by Dr. T. A. Jaggar and Dr. H. O. Wood.

¹ G. C. Curtis: Work Going on at Kilauea Volcano, *Science*, Vol. 38, 1913, pp. 355-358.

EXPLANATION OF FIG. 1—The observer looks northwest across the great lava "sink," in which, on the left, is the active pit of Halemaumau (House of Eternal Fire). The rim of the caldera is seen almost in its entirety from the northeast around to the southwest. In the distance, the cone of Mauna Kea and the long gently dipping slopes of Mauna Loa. In the foreground, Keanakakoi Crater and the border of the Kau desert; smaller extinct pit crater on the right. In the left foreground note the very young, consequent drainage system, cutting the ash-cover surface, and its intersection by lines of faulting. This stream system, unknown before, was brought out by the kite photographs made for the model. An opera glass facilitates locating on the model the "bomb" craters among these channels. The automobile road leading to the active crater may be traced.

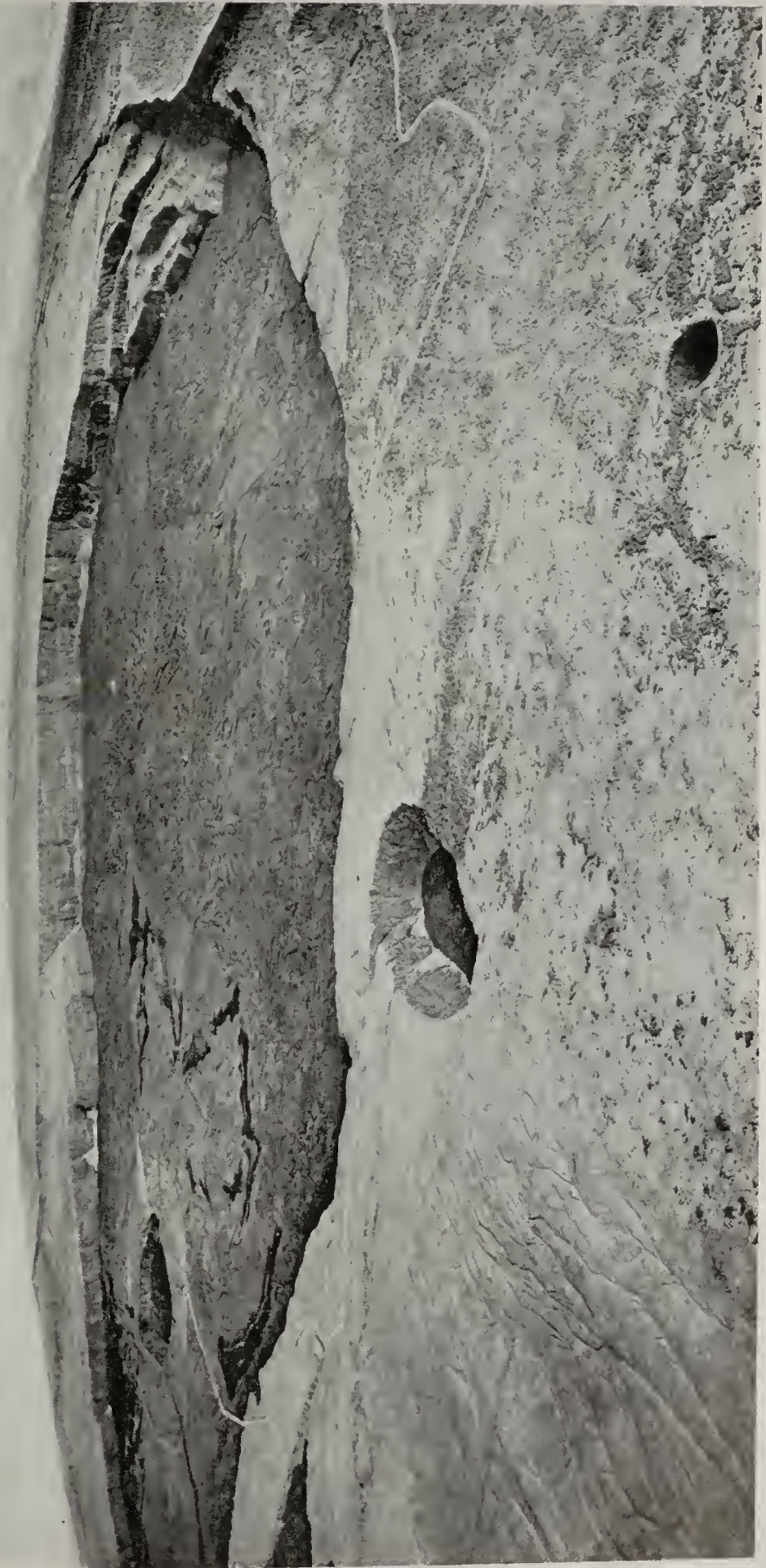


FIG. 1—Photograph of the Kilauea model, giving a general view of the crater. (For explanation, see bottom of opposite page.)
(Figs. 1, 2, and 3 from photos by Burr A. Church; descriptions by G. C. Curtis.)

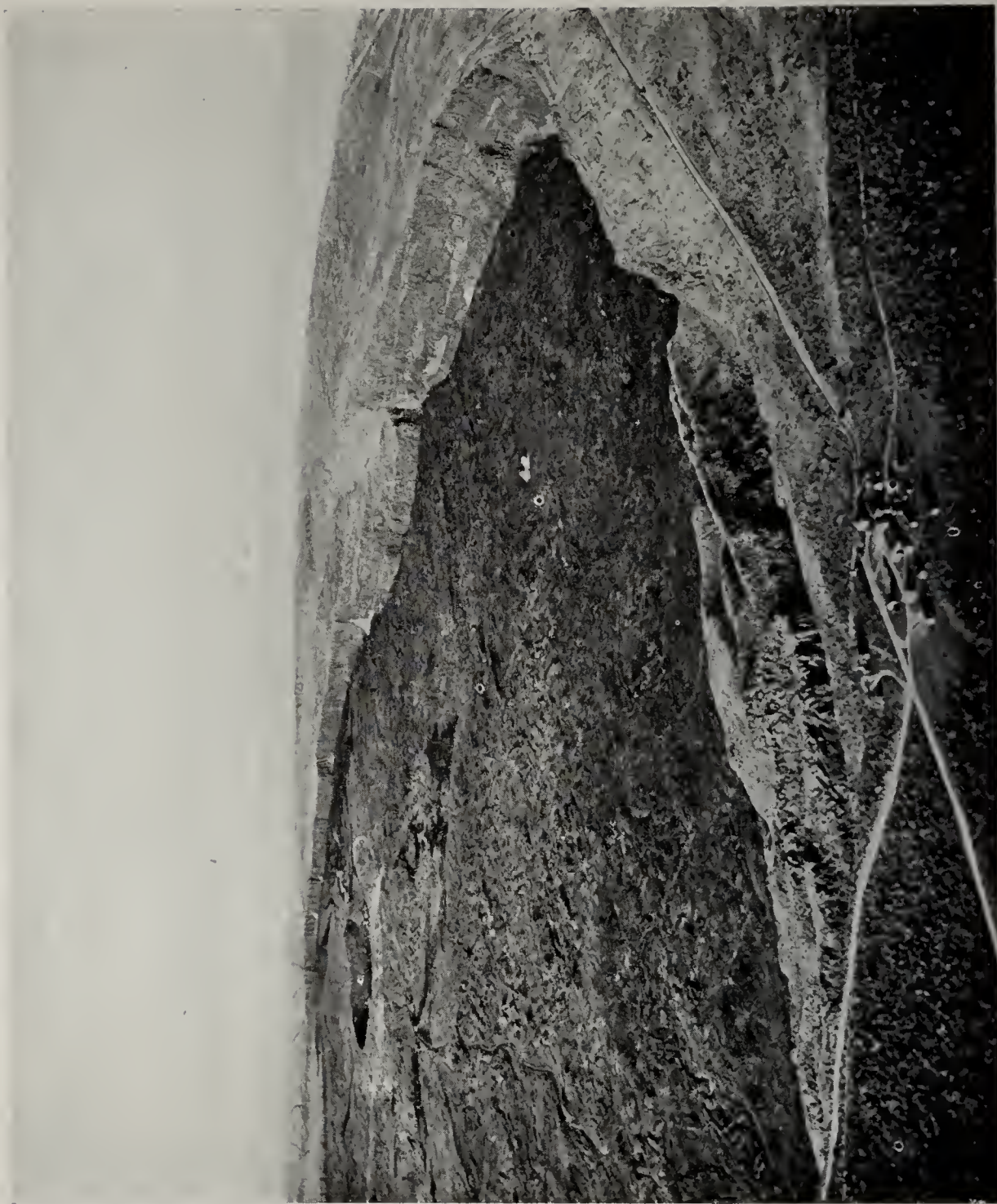


FIG. 2.—Photograph of the Kilauea model looking southwest over Volcano House across the lava sink. In the foreground is the forest, mostly *ohia* trees. The vegetation gradually fades out toward the active crater. The great escarpment may be followed, and in the middle distance lies Halemaunau, where, in the lake of molten lava, the legendary fire goddess Pele has her abode. The dark gray filling of the extensive caldera is built of multitudes of lava-flows, mostly the smooth, or *pahoehoe*, variety, the darker patches being the rough *a-a* (first brought out by the model). In the distance the dim outlines of Mauna Loa, 13,860 feet, may be seen. Note the old "horse trail" crossing the middle of the lava.

FIG. 3—Photograph of the Kilauea model looking northeast across the pit of Halemauau, the molten lake with its fiery fountains being just visible. The liquid lava is 350 feet below the rim of the crater. The observation hut maintained by the Massachusetts Institute of Technology is on the left just back from the rim. Sometimes the molten lava rises nearly to the top of the pit, and again it will sink away so as to make the crater about a thousand feet deep. The dark gray lava field reaches to the base of the encircling caldera walls, in which the old bedded structures of ancient lava-flows, ash beds, and a laccolith may be observed. Talus is seen in several localities at the base of the escarpment. In the left foreground is the summit point Uwekahuna, under which lies a stairway of great down-faulted blocks. Note the Volcano House group of buildings in the right distance, to the left of which is the brilliantly colored Sulphur Bank and, behind, the dark forested slopes of the Kilauea cone.



The most notable relief model of a similar nature made in the United States before this was a model of the coral island of Bora Bora, made by Mr. Curtis at the suggestion of Alexander Agassiz to illustrate a typical high coral island, and installed in 1907 in the Harvard University Museum. It was the first important work of its kind undertaken in America and was based upon photographic and other special surveys. This model and the general question of naturalistic models and their educational value were discussed by Mr. Curtis in an article entitled "Land Reliefs That Are True to Nature" in the *Bulletin of the American Geographical Society* for June, 1911.²

Habitat groups of animal life have become almost a necessity in up-to-date museums, but before the work of Heim in Switzerland and Curtis (who studied under Heim) in America natural representation of earth forms had not been developed. The Bora Bora and the Kilauea models in America, therefore, mark the beginnings of what may be called a new art. While zoölogy and botany have been profiting for some years by the naturalistic or habitat specimens, the development of natural land relief types has nowise progressed to the same extent. It seems to the writer that the main reason for this slow progress is the difficulty of finding individuals who possess the qualifications necessary for such work. To do the work which Curtis is doing one must be a geologist and geographer first of all, and, in addition, an artist, surveyor, photographer, and sculptor. To find the combination of all these accomplishments in one person is difficult indeed. The high cost of the models also has hindered the progress of this work. With kite or airplane photographs, however, the cost of the work will undoubtedly be cut down one-third, or perhaps one-half, and the time necessary to make an elaborate model will also be reduced in proportion. Instead of requiring nearly four years, the Kilauea model, Curtis calculates, could have been finished easily in two years or perhaps much less, had he been in possession of these bird's-eye views during the first year. As it was, the kite views were not obtained until the third year of the work.

A decade has passed since Bora Bora was finished. During that time several new steps in the art have been taken. The first was the use of a revolving panoramic camera, by which five continuous miles of the Kilauea walls were brought into one view on the full scale of the model, assuring complete and accurate modeling of the intricate and seemingly infinite detail of the complicated outcropping structures. The second was the use of aerial photographs, without which reproduction of the forms of the vast and complicated lava floor would hardly have been possible. This lava sink alone took a year of modeling. Features never before observed, like the drainage system on the southeast, the location and distribution of fault cracks and of bomb craters, were first brought to notice by these photographs, although previously the region had been much examined. A third

² Vol. 43, 1911, pp. 418-427.

innovation is the eveloramic baekground, which in a highly satisfactory way solves the old and perplexing problem of how to treat a large area within the limits of museum space. This was accomplished by the addition of a baekground which continues the modeled area through the painting of the natural surroundings in perspective. This not only gives additional information but supplies the familiar, natural environment, lack of which has badly handicapped other work.

The result of all the various means which Curtis has used in the making of the Kilauea model speaks for itself when we view the finished work with or without an opera glass. The writer finds that a six-diameter field glass is even better than an opera glass. The effect is almost that of being at Kilauea itself instead of thousands of miles away.

THE MILITARY CAMPAIGNS AGAINST GERMANY'S AFRICAN COLONIES

By G. M. WRIGLEY

Our measure of military operations is chiefly determined by the events that have happened and are happening in Europe on the western front. We appreciate the significance of the gain of a few hundred yards of terrain, of the capture of a hillock one or two hundred feet high, and we accept the cost paid in hundreds of lives. What then shall we say of the conquest of 300,000 square miles of territory—an area half as large again as Germany—in a period of six months at a cost of less than two hundred lives? Here, in German Southwest Africa, as also in the other African campaign areas, we find warfare on a different plane, controlled by profoundly different conditions. We are here concerned with the geographical aspects of these conditions. The force of geographic control in military operations has been amply demonstrated on the European battlefields.¹ In the African theaters that control has been still more pronounced, though exercised in a different manner. In Europe topographic detail has played a dominant part. In Africa, where man sinks to insignificance by the side of nature, the influence of climatic circumstances and of the vegetative covering of the land has been supreme.

The African campaigns have been conducted under tropical or subtropical conditions in lands still primitive. Into the wilderness war has carried exotic products of modern civilization; it has utilized the old and barbarous with the new and highly developed. A railroad runs through uninhabited tropical forest; motor trucks performing extraordinary feats over broken surfaces and through wastes of sand or mud supplement the native porter. The native guide is replaced by airplane, the strange "bird" that with the terrible new kind of "hippopotamus," the armored car, works havoc with the morale of the native forces. In those regions that are still the paradise of the mighty hunter the wild life furnishes foes not to be despised. The despatch rider abandons his motor cycle before the hippopotamus; General Smuts in his automobile is besieged by lions; giraffes entangle their long necks in the telegraph wires. Everywhere primitive forces have proved strong. Against them the elaborated tactics employed on the European fronts have failed hopelessly. In the African struggles vast areas have been covered by comparatively small bodies of men moving rapidly, and their ability to cover them has depended on the knowledge of the pioneer and on the bushman's art—of traveling without transport, of

¹ D. W. Johnson: *Topography and Strategy in the War*, Henry Holt & Co., New York, 1917. Many of the chapters published in revised form in this book had previously appeared in the *Bull. Amer. Geogr. Soc.* and the *Geogr. Rev.*

making long forced marches, and of living for days on next to nothing. This explains the phenomenal successes of Botha and Smuts, great leaders with a native experience finely sharpened in the guerrilla operations of the Boer War.

Not the least interesting feature of the campaigns is the part that has been played by the native tribes. The loyalty and ready assistance of many pay tribute to the character of British and French colonial rule. Among the particular instances testifying to happy administration is the effort of the Mossis, the people of a little kingdom in the Niger bend under French protection. They promptly raised a volunteer contingent that acted with effect and with much pride and pleasure in the occupation of northern Togoland.² Of the relations between the colonial Germans and the natives it is not easy to speak, but the lot of the German East African porter seems to have been a singularly hard one even in this hard land.

As a demonstration of the value of sea power the campaigns have yet another interest: especially is this the case in the conquest of German Southwest Africa. In the *Geographical Review* for June, 1916, some of the broad features of the campaigns were outlined by Cyrus C. Adams in the article "The African Colonies of Germany and the War." The campaigns will here be discussed in greater detail, each colony being considered separately in the order of conquest.

TOGOLAND

This little colony has heretofore been pointed out with pride as the "pattern tropical protectorate." Of Germany's four African possessions

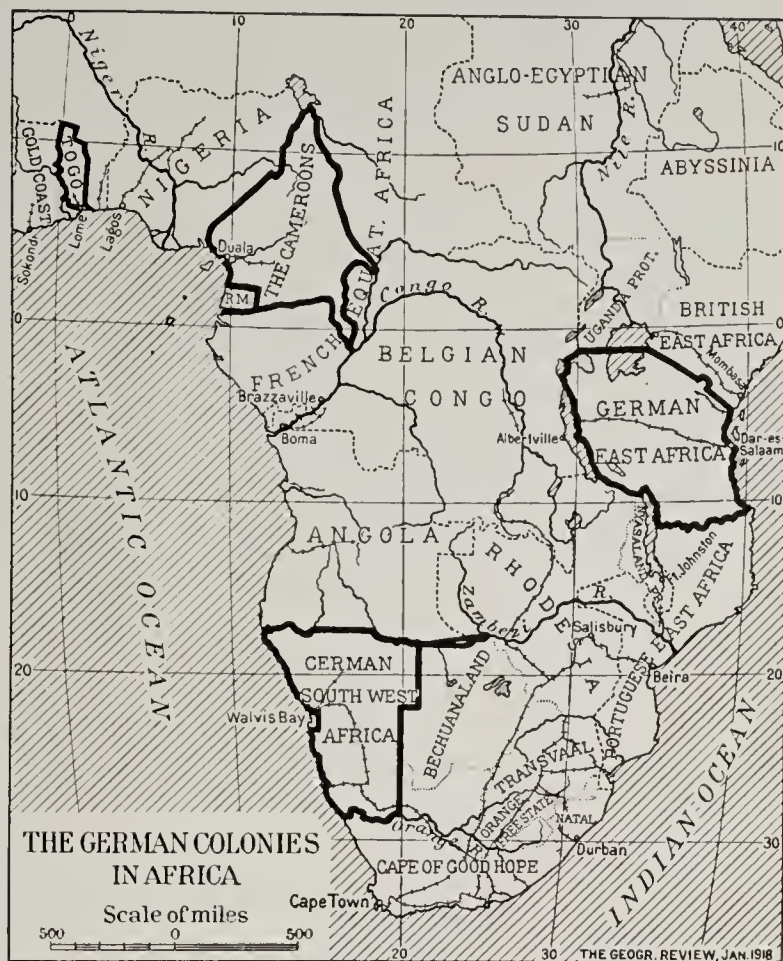


FIG. 1—General map showing the location of the German colonies in Africa. Scale, 1:64,000,000.

² La conquête du Togoland: L'action des partisans mossis, *Renseign. Colon. (Suppl. à L'Afrique Française)*, 1915, No. 4, pp. 49-55.

it was the only one not subventioned and at the outbreak of the war was in a flourishing condition. Togoland occupies a narrow strip between the

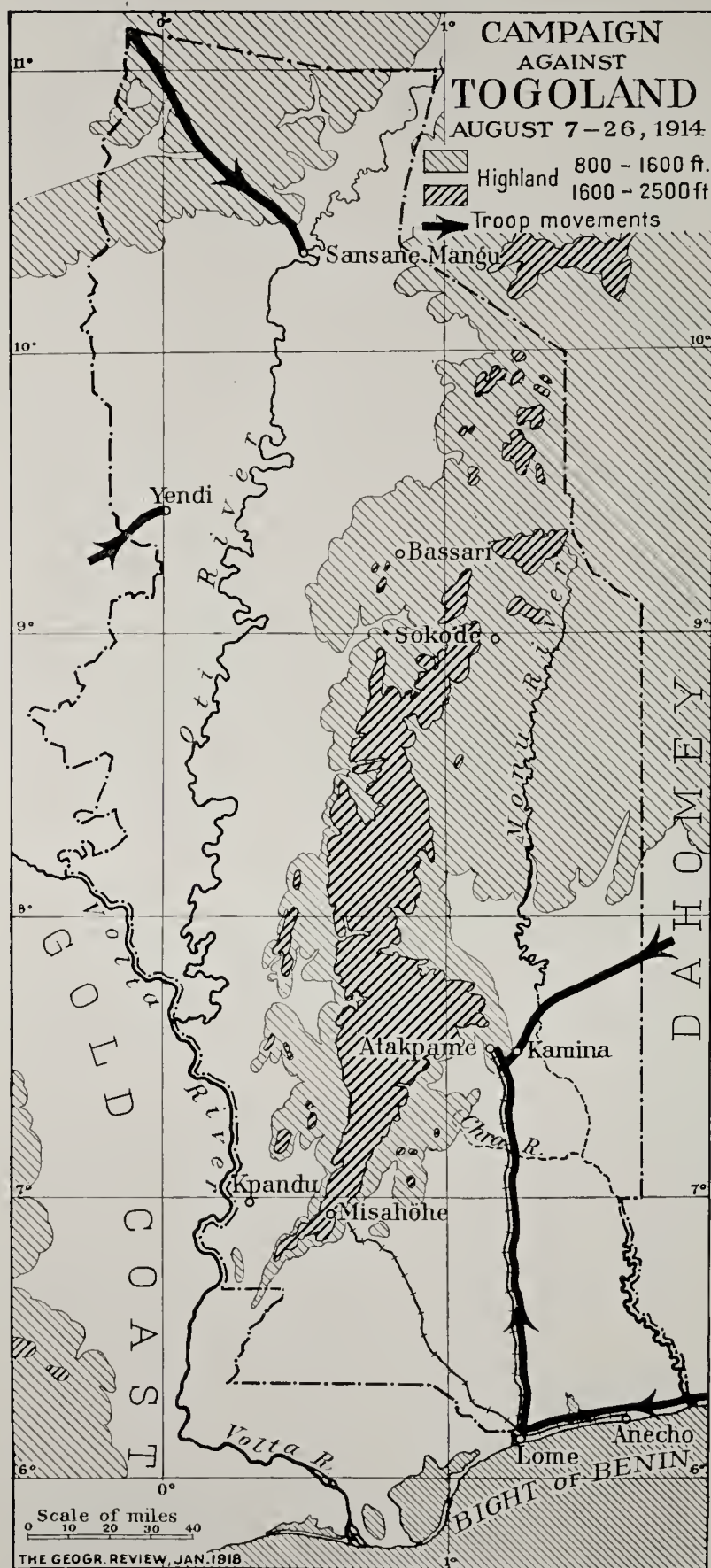


FIG. 2—Map to illustrate the campaign against Togoland. Scale, 1:3,500,000.

Gold Coast and Dahomey. The area is only 33,600 square miles: small size and the limitations incident thereto constitute the controlling factor in this campaign. At the commencement of hostilities in Europe the governor of Togoland made proposals of neutrality to the governors of the adjacent French and British colonies. Naturally his propositions were rejected, and he was shortly called upon to surrender. A lengthy resistance was obviously out of the question, but there existed a definite reason for delaying the Allied occupation as long as possible. The German government had just completed the installation of a powerful wireless station at Kamina. This station could communicate directly with Berlin, and, with the stations at Windhuk in German Southwest Africa and Dar-es-Salaam in German East Africa, it formed a triangle able to control the seas of the southern half of the continent.

The general plan of campaign in Togoland,

as in German Southwest Africa and the Cameroons, consisted in the occupation of the seaboard, the establishment there of the major base of operations, and the simultaneous penetration inward of columns directed from points on the frontiers. In Togoland the German forces had at first been concentrated upon Lome, the principal port. As soon as Great Britain declared war on Germany they were removed inland for concentration on Kamina, the chief strategic site on the southeastern edge of the highland belt that traverses the country from north-northeast to south-southwest. The British occupied Lome without opposition and there were joined by the French coming along the coast plain from Dahomey; thence the Allied column turned inland to cross the coast plain to Kamina. On the coast plain, especially known as an oil-palm region, and the adjacent highlands the major part of the German government's developmental efforts have been expended. The region is served by three lines of railroad: a line of 74 miles from Lome to the southwestern corner of the highland area; a line of 27 miles from Lome along the coast to a point near the French frontier; and a line of 100 miles to Atakpame, near Kamina and one of the chief towns of the interior. This last-named line greatly facilitated the defense. The Germans retreated along it, tearing up the track and destroying bridges where time permitted. The Allied forces repaired and used the railroad and also used the road through the scrub; but the two lines are some distance apart, and co-ordination of movements was rendered difficult by the character of the vegetation. Apparently the original forest cover of the plain has been removed by native agriculturists, and its place is now occupied by scrub of a type recalling the maqui of the Mediterranean or the chaparral of California and western Mexico. During the long dry season drought is severe; indeed, it has been found necessary to establish wells and reservoirs along the railroad. On the coast, with mean temperatures of over 80° F., the rainfall of the four months November to February amounts to about 2½ inches only. After the major rainy season, that is from April to June, swamps remain and tall grasses flourish. Lacking good positions and observation posts such ground is unsuitable for artillery operations; but it is excellent for defense. Actually the defense made no serious stand save at the strong position on the Chra River, where they delayed the offensive by destruction of the important bridge.

Meanwhile the northern part of the colony had been occupied by the Allies with but little opposition. Northern Togoland lies in a natural region entirely distinct from that of the south, with which its relations have been comparatively slight. The northern country is beyond the area of effective German occupation. Its affiliations are with the Sudan and the Desert; its trade is exclusively in the hands of Mohammedan Sudanese merchants, and such as reaches the coast does so chiefly and naturally through the Gold Coast. The main opposition encountered in the northern plains was that arising from climatic conditions. August, the month of the

campaign, marks the height of the single rainy season of this latitude. Sokode, for example, out of a total annual rainfall of 51 inches, has over 12 inches in this month. Yet in spite of continuous rains and inundated country the northern column covered 370 miles in 20 days. With the occupation of Sansane-Mangu by the northern (French) column and of Yendi by a British column from the west the subjugation of northern Togoland was assured.

About the same time, that is three weeks from the occupation of Lome, the main column from the south and the French column from the east arrived simultaneously before Kamina and received the capitulation of the colony.

GERMAN SOUTHWEST AFRICA

In this campaign the British forces acted alone. Angola bounds German Southwest Africa on the north, but Portugal did not join the Allies until some months after the conquest of the colony. The prime interest of the campaign lies in its triumph over one of the most difficult of physical obstacles—the barrier of the desert.

Practically all of the 322,440 square miles of Southwest Africa are arid or semi-arid. On the most exposed frontiers—the coast and the southern and southeastern borders—the aridity is greatest. The coast desert of the Namib, ranging in width from 15 to 85 miles, has only 4 inches of rain a year on its more favored eastern margin; the desert ports have under 1 inch. The stony plateaus of the southern portion of Great Namaqualand also have very little rain. Towards the north the rainfall increases. The heights encircling Windhuk, over 6,500 feet (2,000 meters) high, are comparatively favored; but it is only in the extreme northeast of the colony that 20 inches falls over a significant area. In the absolute desert of the Namib pasture is entirely lacking, and water can be obtained only from wells sunk in the river beds, dry on the surface for years at a stretch. Over the southern interior pasture of sorts is fairly generally distributed, but the water supply is scant and sharply localized. The happy combination of pasture and water is of none too frequent occurrence.

In proportion to the strength of the desert barrier is the value of the railroad. The military necessity of such an artery was admirably shown in the Peruvo-Chilean War of 1879-83, the campaigns of which were carried out in an area physically analogous to Southwest Africa. Today Chile is just completing her great strategic railroad from the populous centers of the south to the northern limit of the nitrate fields; for 900 miles the line runs through desert country. A like problem is being created by the opening up of northern Africa. In the plans for the development of her African territory France has recognized the strategic as well as economic value of the Trans-Saharan railroad.³ In Southwest Africa the railroad formed one

³ Evans Lewin: *Railways in Africa*, *United Empire*, Vol. 8, N. S., 1917, pp. 23-30, 94-99, and 172-178; reference on pp. 23-30.

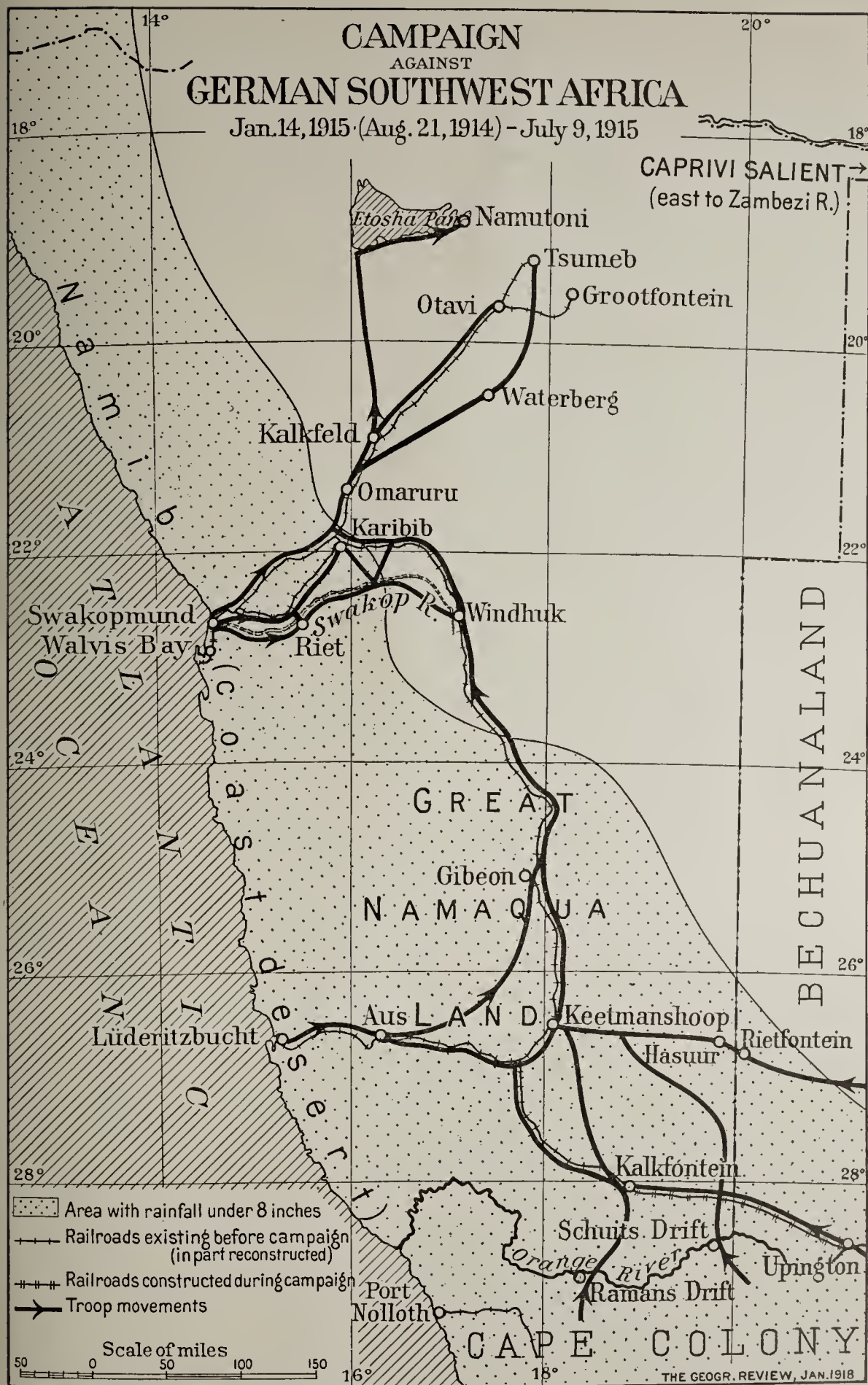


FIG. 3—Map to illustrate the campaign against German Southwest Africa. Scale, 1:7,750,000.

of the major defensive works upon which the Germans employed themselves so assiduously from the conclusion of the Herero War, 1904-05. The present system incorporates a dorsal railroad from Otavi and its branches in the north to Kalkfontein in the south; lateral branches connect with the coast at Swakopmund, the port for Windhuk, and Lüderitzbucht, the port of the diamond fields. At the beginning of the war about 1,300 miles of line were in operation. Of this only the Otavi line serving the copper mines of the north was paying expenses; the value of the system was strategic. Since the beginning of the campaign the Southwest African system has been connected with that of the Union of South Africa by a line from Upington on the Orange River to Kalkfontein, the southern terminus of the German system.⁴

In the Peruvo-Chilean war the first step towards conquest of the desert lay in securing control of the sea highway of communication. When the Peruvian fleet had been defeated, Chile gained the seaboard, and the fate of the campaign was decided. In the Southwest African desert control of the seaboard was likewise of vital importance. It was essential that Swakopmund and Lüderitzbucht should be occupied as bases and the sea highway to the Cape be maintained. Apart from retaliation to the German attack on the Orange River and the subsequent unfortunate affair of outposts, the first British move was to recapture Walvis Bay, seized by the enemy on the declaration of hostilities, and to occupy Lüderitzbucht. Before further advantage could be taken operations were, however, suspended for a time. The revolution within the Union successfully stimulated by Germany in the main accounted for the delay, but a contributory cause was the temporary disturbance of British sea power occasioned by von Spee's attack off Chile. The battle of the Falklands was necessary to restore confidence in the southern seas.

The real offensive against the colony began early in 1915. A northern and major column under General Botha started from Walvis Bay and Swakopmund. In the south three main columns invaded the colony simultaneously; one proceeded from Lüderitzbucht, and another, in three sections, from the Orange River. The third, having Kimberley as base, crossed the Kalahari Desert and entered German territory from Rietfontein. These three columns planned to unite at some point on the railroad near the junction of Keetmanshoop, thence to proceed on Windhuk from the south as Botha's column advanced from the west.

The hardships of the northern column began with the landing at Walvis Bay, of which the personal narratives paint unattractive pictures. The natural harbor is excellent, but landing facilities were undeveloped. All other native resources are lacking, and the climate is peculiarly disagreeable. The order of the day was "humidity, fog, and cold each morning,

⁴ *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 879.

atrocious wind every afternoon and evening.”⁵ Although situated within the tropics this portion of the coast is swept by the cold Benguela Current, which, like the Humboldt Current on the corresponding shores of South America, lowers the temperature and is in part responsible for the characteristic fog belt that hangs over these coasts. Although the air is humid, rain is practically unknown, and except on rare occasions the river beds are dry. An unusual phenomenon that might have been regarded as a happy augury greeted the arrival of the commander in chief; the Swakop River came down in flood and flowed for a day after Botha's entry into Swakopmund. It was the first time for some fifteen years that the river had reached the sea, and it swept away the railroad built across the flats of the river mouth. But the flood was hailed as a promise of unusually favorable conditions in a region where the water supply is the ever-present question. From their landing the forces were faced by this question. Walvis Bay is absolutely dependent for its water on sea-water distilleries of limited capacity, and at first water had to be brought from the Cape, 800 miles away. On the march inland the troops mainly depended on the water holes in the Swakop River. The holes and wells, carefully charted on the maps, are generally nuclei of tiny settlements. Round the most important of them was fought the sharpest and most decisive action of the campaign—the Pforte-Riet-Jakalswater engagement. Advance was made up the river bed and by the reconstructed railroads. Across the desert belt impediment to transport was peculiarly great, the highly micaceous sand causing wheeled vehicles the greatest trouble. Success indeed depended on the mobile army's ability to surmount difficulties of transport. Arid sand and bare rock contributed a curious feature to the campaign. The blasting necessary in sinking for water requires the use of enormous quantities of explosives; every farm had its own stock of dynamite. The German forces could thus draw on vast stores, and they took full advantage of their opportunity. The degree to which the roads were mined is a marvel only exceeded by the singular failure of the scheme.

The difficulties of the northern column were fully shared by their co-operators in the south. They, too, faced lack of water, poisoned wells, scant grass, and absence of native resources. Even the cattle had been moved from the grazing grounds. In one instance the force crossing the Kalahari on its 600-mile march from Kimberley found itself 120 miles from the next water site. The problem of supply was solved by establishing two intermediate stations to which water could be carried by motor over these 40-mile jumps. The column from Lüderitzbucht had the advantage of the railroad, but even the iron line has to pay the toll of the desert. In the Grasplatz section of traveling dunes some hundreds of laborers must be kept constantly

⁵ P. A. Bridel: *Notes sur la campagne du sud-ouest Africain, Bibliothèque Universelle et Revue Suisse*, Vol. 82, Lausanne, 1916.

employed clearing the line, an item of upkeep said to have cost the German government about \$50,000 a year.

The three southern columns met as planned near Keetmanshoop, and the enemy began their retreat on Windhuk, clinging to the railroad and tearing up the line as they went. To save the line and hasten the retreat or cut off the enemy the pursuers made a tactical move involving one of the chief engagements of the campaign. A flying column, traveling without transport, cut across the desert, intercepting a part of the German force at Gibeon. Thence the remaining enemy fled full speed to Windhuk.

Windhuk, the capital of the colony, capitulated to the northern column on May 12, 1915. From here the final stage in the campaign was developed in characteristic fashion. A frontal line of attack followed the northern railroad. Two important flanking columns co-operated. One, to the right, skirted the Waterberg escarpment, cut the southern fork of the railroad, and occupied Tsumeb. This column covered 300 miles in 15 days. The left column made a still greater detour, striking north through country almost entirely devoid of grass and water and covering 350 miles in 13 days. After skirting the Etosha Pan the column closed on Tsumeb from the west. Thus the German force at Otavi was completely outflanked and finally surrendered on July 9. In the northern portion of the country, extensively covered with thorn bush, valuable reconnaissance service had been rendered by airplane. The airplane indeed was not unknown in Southwest Africa before the war. The German government had begun aëronautical experiments in the colony with both military and civil objects in view, and an experiment station had been erected in Karibib.⁶

The major operations carried out by the forces from the Cape had been supplemented early in the campaign by Rhodesian troops, who occupied the Caprivi finger, "that inconvenient salient" giving Germany access to the navigable waters of the Zambezi above the Victoria Falls. Altogether conquest was achieved with a loss of only twelve score lives. To secure possession of this territory Germany had previously paid heavily in money and human life. The Herero War alone cost a sum approximating a hundred million dollars, required the services of thousands of troops from overseas, and wiped out the greater part of a numerous tribe.

THE CAMEROONS⁷

The geographic and strategic center of this territory of 191,130 square miles is the central plateau of Ngaundere and its westward continuation, known under a variety of names, to Banyo. The average elevation of the

⁶ Aviation in German Africa, *Commerce Repts.*, Sept. 18, 1914.

⁷ In a recent letter to the *London Times* (*Literary Suppl.*, May 4, 1917) Sir Harry Johnston points out that the plural (The Cameroons) and not the singular form (Cameroon, Kamerun) is the correct version of this word, being derived from the name given in 1470 by its Portuguese discoverers to the Duala estuary (Rio dos Camarões; *camarões*, prawns, or shrimps) on account of the large number of prawns found in its brackish waters.

plateau is from 3,000 to 4,000 feet. It extends eastward practically to the frontier of French Equatorial Africa and westward is continued as a series of parallel ranges to which is aligned the Nigerian frontier. In the extreme southwest the highland terminates in the volcanic massif of Cameroons Mountain. Northward the central plateau drops sharply to the plains of Chad with island-like massifs continuing to within 100 miles of the lake. Southward the plateau sinks gently to the 1,500- to 2,000-foot level maintained in the southern Cameroons. It is bordered by a coastal zone 30 to 75 miles wide.

Two points on the borders of the central plateau are of prime importance in relation to it: Garua, the northern outpost in the fertile plains of the north, and Yaunde, the southern post on the edge of the unbroken tropical forest that stretches from this station to the littoral. The savana country of the plateau and northern plains, with a distinctly dry winter season, is generally healthful. The coast plain, the oil-palm region *par excellence*, and the seaward slopes of the plateau, hot, moist, and characterized by very heavy rainfall, have an ill fame as one of the most unhealthful parts of Africa. The rainfall record of Bibundi, on the Cameroons Mountain, 355 inches (9 meters), is surpassed only by the extraordinary rainfalls registered in Assam. The coast region of the Cameroons is notoriously a habitat of the tse-tse fly; cattle cannot be raised, and sleeping sickness is rife.

For some years the forest barrier kept back German penetration. It began in 1887 with the establishment of the military post Yaunde, now one of the great route centers of the interior. Railroad construction later began to open up the coast plain. One line runs from Duala, the commercial capital at the head of the Bay of Cameroons, northward to the highlands; another follows the plain southeastward to a point beyond Edea on the Sanaga River.

The general plan of campaign in the Cameroons proceeded along lines similar to those adopted in Togoland and Southwest Africa. The seaboard was invested in September, 1914, and Duala, the chief port, established as a major base of operations. Minor bases on the coast were also created for the little flotillas that patrolled the navigable rivers. The Allied troops for the major column came by the sea highway, the force despatched from England picking up native reinforcements from the British West African possessions en route and meeting a French detachment at Lagos. Converging columns acted from the land frontiers. A British force from northern Nigeria co-operated with a French column from the Lake Chad territory. From French Equatorial Africa, where at the outset mastery was gained over the Congo-Ubangi route, columns penetrated by the east and southeast. Another force penetrated from the west by Coco Beach, the little port of that strip of coast south of the enclave of Spanish Guinea (Rio Muni).

From the main column in the south a division was detached to secure the northern frontier of Nigeria. It obtained possession of the Cameroons

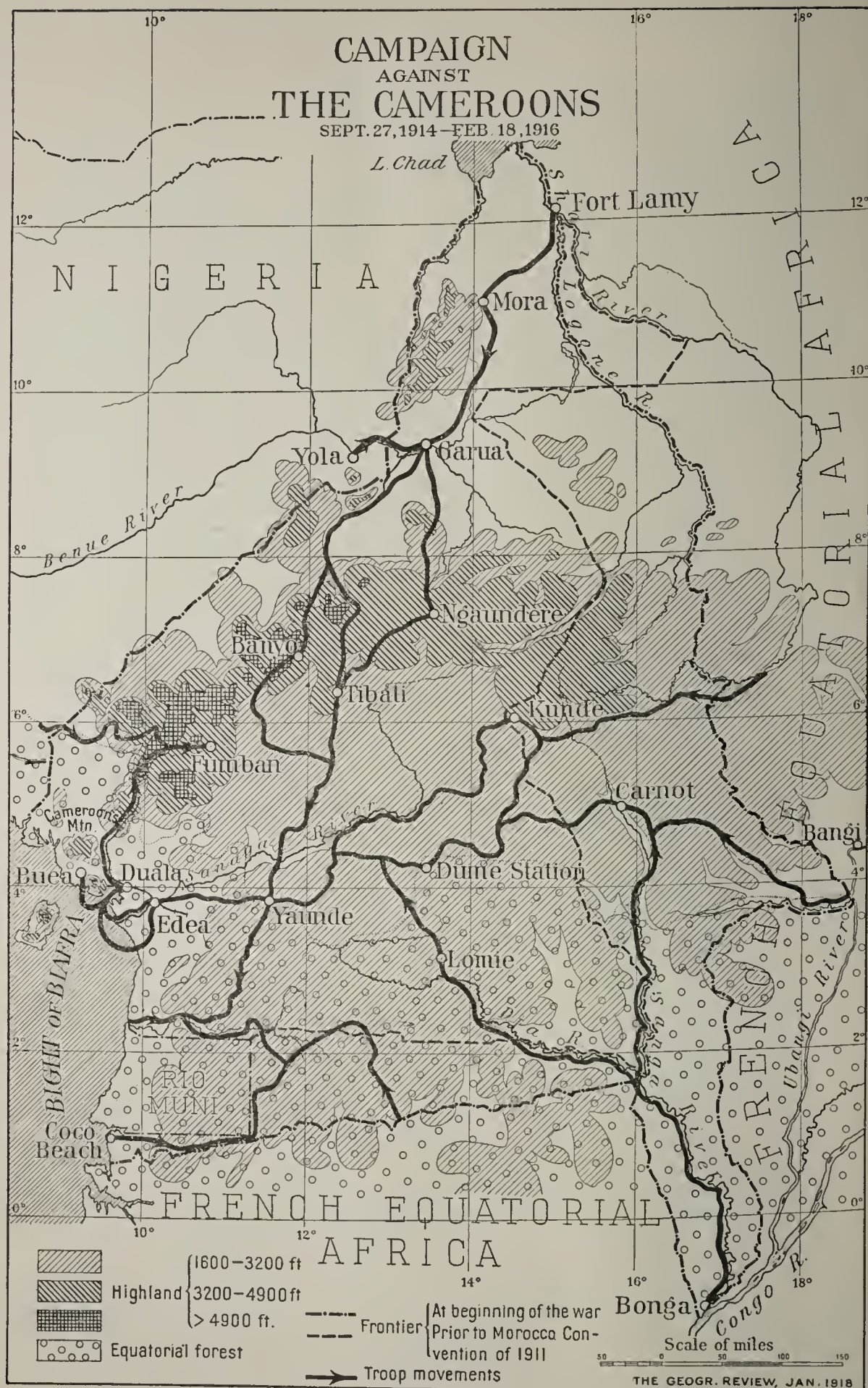


FIG. 4—Map to illustrate the campaign against the Cameroons. Scale, 1:9,800,000.

Mountain region, with the administrative town of Buea and, after an initial reverse, the northern railroad. The main column was directed on Yaunde. Here, in the face of supreme difficulties of transport, progress was slow. Reconstruction of the railroad to Edea and the building of roads materially improved the situation, yet in the main convoys were dependent on native paths and native carriers. Over 7,000 carriers were employed, most of whom came in monthly detachments from Sierra Leone, Nigeria, and the Gold Coast. But the season of heavy rains, May to September, suspended all operations. The great offensive did not begin in fact until the approach of the little dry season towards the end of October (1915).

Action advanced more rapidly in the north. The early British attack on Garua failed. The strength of the fort had been underestimated, heavy August rains flooded the country, and the attacking force was compelled to retire on Yola. In January, 1915, after the subsidence of the floods British and French forces united before Garua to assault again the northern key to the plateau. Garua, the center of a splendid agricultural and grazing district, stands on a hill overlooking the Benue River, here navigable for large barges. The strength of its defenses might well have been taken as a measure of its importance. On them some thousands of laborers had been engaged for several months. The fort held out until June; the chief factor in its capitulation appears to have been the mutiny of the native soldiery, terrorized by the besieger's artillery fire, especially by the execution of the French 95-centimeter gun.⁸

With the fall of Garua the way to the plateau was open and the Allied column made rapid advance southward. Their work approached completion with the taking of Ngaundere. Ngaundere is on the edge of the fertile agricultural land of the north. South of it begins the "equatorial poverty with its sole and never-ending resource, manioc; its vegetation so dense, so puissant, so useless; its population successively more barbarous and scant in number; its harbingers of the tse-tse fly announcing the fate that awaits the unhappy inhabitants."⁹ The steep ascents to Ngaundere had been strongly fortified, but on this occasion climatic phenomena came to the assistance of the attackers. A violent tornado, unusual at the height of the rainy season, flooded the trenches and drove out the defenders. A similar occurrence is also reported to have taken place at Banyo, another important plateau station, that, like Ngaundere, had been strongly fortified and amply provisioned with cattle and grain.

Meanwhile the columns in the east and southeast had been acting with zeal in a particularly difficult country. To their labors, however, was added the triumphal reoccupation of the African "Alsace-Lorraine." For in this light French Equatorial Africa regarded the 100,000 square miles of territory ceded to Germany by the Morocco Convention of 1911, whereby

⁸ A plan of the defenses of Garua may be seen in *L'Afrique Française*, Oct.-Dec., 1915.

⁹ La conquête du Cameroun septentrional, *L'Afrique Française*, Oct.-Dec., 1915, p. 288.

the colony gained access to the navigable waters of the Ubangi and the Congo. Where the waterways could be used unusually good lines of communication could be maintained, and the Belgian authorities supplemented French resources by putting their river steamers and artillery at the disposal of the column acting on the Sanga River. But penetration westward was made through scantily peopled forest country traversed only by native paths. Nevertheless the eastern and southeastern columns co-ordinated successfully with the other columns in the march on Yaunde. This last German defense they reached during the first week of January, 1916, a few days after the entry of the main column of the south. Successful as the co-ordination had been, the columns were unable to safeguard all routes of escape, and a large part of the enemy force slipped through into the neutral territory of Spanish Guinea. So ended a campaign aptly described as "amphibious in the widest sense."

GERMAN EAST AFRICA

German East Africa was by far the most important of Germany's colonial possessions. Occupying a central location and fronting the Indian Ocean the colony enjoyed a position strong both strategically and economically. Moreover to the natural defenses liberally bestowed upon the territory had been added elaborate military preparations. At the outbreak of hostilities the situation was highly favorable to the German colony.

German East Africa is a compact territory. With an area of 384,000 square miles it has frontiers 2,700 miles long and a distance from end to end of not over 700 miles. On the seaboard defense is favored by the character of the coastal plain, 10 to 30 miles wide in the north, broadening to the south—a zone of damp heat fringed on the littoral by mangrove swamps and clothed elsewhere by dense scrub. Tanga and Dar-es-Salaam, where railroads start for the interior, had been strongly fortified. The interior plateau with a general altitude of 3,000 to 4,000 feet presents very diversified topography along the inland frontiers, especially those of the north and northwest. The volcanic mass of Kilimanjaro rises to 19,700 feet; the Soda Lakes of the eastern rift valley west of Kilimanjaro lie at an elevation of about 2,000 feet. Between Kilimanjaro and Victoria Nyanza the Anglo-German boundary, purely artificial, lay in a frontier zone defended by its aridity and inaccessibility. The lakes of the western rift valley—Kivu and Tanganyika and the connecting stream—defined a natural boundary, as did Lake Nyasa to the southwest. On this last lake and on Victoria Nyanza supremacy was held by the British, but on Tanganyika the Germans with four armed vessels to one Belgian boat held the advantage of 400 miles of easy communication.

On all the fronts except the northeastern the Allies suffered from the remoteness of their bases. The Belgian forces from their base in Boma had to traverse the entire Congo territory. The rail and steamer route via

Stanleyville to Albertville, completed in March, 1915, proved invaluable, but transport to Kivu and the northwest frontier entailed a long service of caravan and porter. From the Rhodesian front the nearest point on the railroad was distant 400 miles. Against these difficulties sustained by the Allies stand in contrast the shortness and general superiority of the German



FIG. 5—Map to illustrate the campaign against German East Africa. Scale, 1:8,750,000.

lines of communication. The German section of the trans-African steam route was completed to Tanganyika (Kigoma) in 1914.¹⁰ It follows an ancient highway, the old caravan road of the Arab traders in slaves and ivory. On it stands Tabora, one of their settlements, then as now the strategic center of the plateau and a crossing point of roads east and west, north and south. From Tabora the German government had also constructed several good roads, including two to Muansa, their principal port on Victoria Nyanza. Besides the central railroad a line connected the coast

¹⁰ Completion of the Tanganyika Railroad, *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 288.

with the beautiful and healthful Usambara Highlands, the only part of the colony where white settlement had made any considerable headway.

Of the many "fronts" along these diversified frontiers that of Kilimanjaro, because of its relation to the Usambara Highlands and its comparative accessibility, claimed by far the greatest strategic interest. On the German side the northern railroad permits easy transportation between Tanga and Moshi; on the British side is the Uganda railroad, here paralleling the frontier and not more than 50 miles from it in a straight line. At the outbreak of hostilities there were only 1,200 troops all told in British East Africa. In the German colony were about thirty times as many, with a large proportion of them massed on the Kilimanjaro front. The German forces used their advantage to make several happily unfruitful raids at various points on the Uganda line. One of the first attempts affords a certain ironical amusement. The invaders, using their own excellent maps, arrived within 20 miles of the railroad, when, being forced to depend on inferior British cartography, they lost themselves in the waterless bush to be picked up dying of thirst by a British patrol! The major enemy operations, however, were confined to the road between Taveta and Moshi, waterless indeed for long stretches but nevertheless the most practical inland route between the territories of British and German East Africa.

Among the most important British operations in 1915 was the blockade of the coast. Although the use of Zanzibar and Pemba as a base in such operations is perhaps only a poor consolation for lost Heligoland, the dearly bought islands simplified somewhat the difficult problem of the blockade of 600 miles of coast. As it was, the blockade was forced by two supply ships, and at the end of her adventurous career the *Königsberg* succeeded in escaping to the Rufiji River, where she was finally located and destroyed, not however before her guns had been removed for use in the interior. It is interesting to note that the destruction of the *Königsberg* occasioned the first use of the seaplane in the directing of gunfire.¹¹

The coast also was the scene of the early and unfortunate attack on Tanga. Here as in similar attempts elsewhere the enemy strength had been underestimated and the natural defenses likewise unappreciated. The attacking forces, dispersed in the almost impenetrable scrub of the coast plain, fell victims to well-planned ambushes. Not the least of their troubles—strange as it may sound to those thinking in terms of the temperate zone campaigns—came from the wild bee, so prolific here as to be a formidable foe.

During the first year of the war the Allied forces were on the defensive on all the fronts. In British East Africa the Germans occupied a section extending beyond Taveta, and on several occasions Nairobi, the administrative center, had been threatened. Until the beginning of 1916 the campaign

¹¹ See Henry Woodhouse: *Textbook of Naval Aeronautics*, New York, 1917. On p. 113 is an aerial snapshot of the *Königsberg* lying in the Rufiji.

awaited more troops and different tactics. The greater part of the German East African plateau is covered by savana, grass steppe, or scrub ranging from the waterless thorny acacia bush at the base of Kilimanjaro to the well-grassed and wooded hills of the Ruanda cattle country. In such country the tactics of the European theaters inevitably failed; here as elsewhere in the African campaigns was there need for the bushman's art. A successful offensive began only with the arrival of General Smuts to take over the command. By this time (February, 1916) the British forces had been raised to over 40,000, while in the Belgian Congo had been accomplished the remarkable feat of raising an army of 20,000 well-disciplined and devoted soldiers, possessing the supreme virtue of "knowing how to live on nothing."¹²

The solitary mountain is a natural feature peculiarly impressive. To the savage it appears as an object of awe and worship, nor do the civilized escape its spell. When Rebmann, the discoverer of Kilimanjaro, first looked upon that mountain he fell to his knees reciting a psalm of praise. Little wonder that the white-crowned "monarch of African mountains" is enshrined in native tradition: "who possesses the mountain will rule the country." Kilimanjaro lends a prestige invaluable in a field where military success rests on native help. But beyond its worth as a moral asset and beyond the economic value of its fertile slopes it occupies a strategic position; Kilimanjaro is the key to the campaign in German East Africa. When General Smuts arrived in East Africa he immediately began the vigorous offensive that in a few weeks put this key into British hands. The need for prompt action was imperative. The season of heavy rains, March to May, was impending, and in the Kilimanjaro region the rains are true equatorial torrents. Then the black soil, of a nature similar to the black "cotton" soil of India, becomes a spongy slough, and transportation is virtually at an end.

The principal action took place in the gap between Kilimanjaro and the Pare Mountains against an excellent German position. The broken foothills of the great mountain protected the enemy's left flank; swamps defended the right; two roads afforded communication with the railroad in the rear. Taveta was the main objective of the British forces advancing through the thick bush of the Serengeti plain. The regaining of this station—Taveta is on the British side of the frontier—opened up the roads into German territory. By the one Moshi was reached. Here the forces from the east met the minor column that had secured the western slopes of the mountain from Longido. By the other and inferior road the railway

¹² Since the beginning of the war the Belgian Congo has also witnessed a great economic development. Exports in 1914 amounted to 53,000,000 francs, in 1916 to 129,000,000. In 1916 were supplied to the munition plants of the Allies over 22,000 tons of palm nuts, nearly 4,000 tons of palm oil, and 3,000 tons of rubber. The estimated production of metal from the Katanga copper mines for 1917 is 30,000 tons, nearly three times as much as in 1914. Over 1,000 miles of telegraph wire have been laid, railroad construction continues, and river craft is continuously being augmented from the shipyard established at Havre for this purpose. (Cable received by the Belgian legation in Oct., 1917, and communicated to this Society.)

was cut at Kahe; along this road was promptly extended a branch line from the Uganda railway at Voi, which relieved the burden of transportation from the Mombasa base. Conquest of the Kilimanjaro area was completed.

No doubt had ever existed in regard to the first step in the campaign; as to subsequent procedure several possibilities lay before the commander-in-chief. The Usambara Highlands offered the great prize of the campaign; the larger part of the white population was concentrated here, and here were flourishing plantations—coffee, banana, tobacco, with rubber and sisal on the eastern lowlands. The value of exports from Tanga greatly exceeded that from any other port in the colony. But the highlands were too well defended. The Tanga disaster had made clear the difficulties of an eastern approach. On the west the mountains descend precipitously to the broad belt of thick bush that separates them from the swift Pangani River, impassable at most points and everywhere pestilential. Concentration of the German forces in the highlands made any attempt on them unfeasible at this juncture. Penetration by Dar-es-Salaam was ruled out largely on climatic grounds. Immediately after the rainy season the malaria-haunted coast is in its most unsalubrious state and hence was likely to prove particularly disastrous to a force two-thirds of which was white. Moreover, during the cooler months, April to October, the southeast trade wind that blows variably with the southwest monsoon and at times is developed with great force renders landing an arduous and even impossible performance. Belgian operations on the northwest needed only the support of a comparatively small British column. For the major forces there remained an attempt to strike south from Kilimanjaro into the heart of the country. Strategically this plan had much to commend itself. Such a move would separate the chief German army in Usambara from Tabora and the northwest and the enemy's principal resources in men and cattle—Ruanda province is estimated to contain 2,000,000 natives and 2,500,000 head of cattle. To avoid such a contingency forces would be drawn from Usambara and the highlands thus laid open to attack. The strategy proved successful. A mounted column from Arusha skirted the western edge of the arid Masai Steppe, occupying in succession the stations where springs issue from the scarp that defines this edge of the steppe. Unfortunately the heavy rains in this region had prevailed unusually late. By the time that Kondoa-Irangi had been reached malaria had seriously depleted the fighting force, their 200-mile line of communication was a continuous quagmire, and the tse-tse fly had carried off half their horses. Yet the column under its Africander chief continued to press forward and succeeded in cutting the central railroad at three points, securing it from Kilimatinde to Kilossa. About the same time the eastern column, that had fought its way through the wooded maze of the Nguru Hills via Handeni, reached the railroad at Morogoro. Already Usambara, with its defensive force weakened, had fallen under attacks from the interior and

the coast. Coast towns from Tanga south fell in a sequence culminating with the capitulation of Dar-es-Salaam in September.

While these actions were taking place in the east columns in the north and west were converging on the central stronghold of Tabora. The British column had secured a valuable base in the German lake port of Muansa whence good roads run south to Tabora. Belgian columns advanced via Kigali, the capital of Ruanda, round the wild volcanic desert north of Lake Kivu and also to the south of the lake. Earlier in the year several British gun-boats brought overland from Cape Town to Lake Tanganyika had obtained command of the lake and co-operated with land forces in the occupation of the lake ports. Completion of this work released another Belgian column for the march on Tabora. Tabora fell shortly after the capitulation of Dar-es-Salaam and with it the entire country north of the central railroad passed into the possession of the Allies.

Driven from the north the German forces took refuge in the lower Rufiji valley and the Mahenge plateau. To the former the main body of the enemy retreated from Morogoro through the Uluguru Hills, where for the first half of the way they had the advantage of a partially constructed military road. Close pursuit, however, did not leave them long in possession of the Rufiji, though indeed it is difficult to see how a considerable force could have been long maintained in this most undesirable region. During and immediately following the rains the Rufiji is notoriously unhealthful even for German East Africa. In the dry season water is scarce or absolutely lacking over great stretches. The precariousness of the water supply and the limited food resources are reflected in the scant native population. In contrast, and especially in point of healthfulness for the European, the Mahenge plateau offers decided advantages, and for this reason it was adopted as the enemy headquarters during the succeeding rainy season.

While the extent and varied topography of the southern portion of German East Africa result in a varying distribution of rainfall, the rainy season of the south as a whole may be said to coincide with the "summer" months, November or December to April, earlier in the interior than on the coast.¹³ Here, as in the north, the torrential nature of the rains seriously impedes or altogether prevents military operations. Moreover the rainy season of 1916-17 was remarkable for its intensity and long duration, and little activity could be displayed until the end of May, when the general offensive in the south may be said to have begun.

Even more than the campaign in the north has the southern campaign been controlled by the peculiar natural difficulties of the country. Compared with the north the south has been very little developed. Except for the rubber, sisal, and cotton plantations of the Kilwa-Lindi coast lands and the coffee fields of the well-watered slopes at the north end of Lake Nyasa, European cultivation appears only at one or two administrative centers of

¹³ For a note on the climate of German East Africa see the "Geographical Record" in this number.

the southern interior. The native population is far inferior in numbers to that of the north. According to figures for 1913 the density per square mile is 1.6 for the administrative districts of Songea and Kilwa and 1.3 for Iringa. In contrast Ruanda, the great recruiting ground for the *askaris*, containing over 25 per cent of the native population of German East Africa, has the surprising density of 72 to the square mile.¹⁴ The broken country of the south, waterless over considerable stretches, covered for the most part with a "dry-forest" of spiny acacias and like drought-resisting trees and bushes, favors guerrilla warfare at the expense of clean and rapid subjection of the enemy. Its conquest was no light task. The Allied forces planned to accomplish it by the establishment of a cordon around the now scattered enemy groups, and this plan involved the co-operation of numerous columns. Belgian forces that had pressed on after the fall of Tabora invested the Mahenge area from the north. Farther east was the British column pressing on the Rufiji River, where it had been supported by other British troops, mostly Indian or native African (Nigerian) from the delta, and similar attacks from the coast were directed from Kilwa and Lindi. The Portuguese became active on the Rovuma frontier, but the chief action devolved on the Rhodesian-Nyasaland forces, which already during the northern operations had penetrated into German territory along several lines. Of the geographical and military relations in their sphere by far the most striking pertain to the problems of transportation. The Rhodesians received their supplies by two extraordinary routes. The one from the base of Salisbury involved 600 miles of railroad and 400 miles of highway, now improved to admit of motor lorry, though at first only practicable for porter service, the use of transport beasts being restricted by the occurrence of the tse-tse. The alternative route was characterized by frequent transshipments: from Durban by sea to Beira and thence to Chindi; by river steamer up the Zambezi to Chindio; by the Shirè Highlands railroad to rail head; by road to Fort Johnston on Lake Nyasa; by lake steamer to Karonga; and finally by carrier or motor lorry to Abercorn near the southern end of Lake Tanganyika. The problem of supply was rendered still more difficult by the scant native resources of this undeveloped country.

The story of the southern campaign is that of the gradual tightening of the Allied cordon, combined with the isolation and capture of the scattered detachments. Mahenge fell to the Belgians, and the enemy in this district was then cut off from the southeastern valleys. In the coast hinterland he was pushed successively southward, from the Kilwa district to the Mbemkuru valley and thence to the Lukuledi, where to the east of the Lukuledi Mission the last stand was made. A small detachment is reported to have sought refuge in Portuguese territory, but German East Africa is now, December 1, 1917, in undisputed possession of the Allies, Belgium and Britain.

¹⁴ *Bull. Imperial Inst.*, Vol. 12, 1914, p. 582. See also the map of population density in Meyer: *Das Deutsche Kolonialreich*, Vol. 1, p. 80.

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CORVO, OUR NEAREST EUROPEAN NEIGHBOR

By W. H. BABCOCK

Far at sea from Portugal, straggling in a long northwestward line toward America, lies the archipelago sometimes called the Islands of the Sun or the Western Islands but now generally known as the Azores. That line breaks into three divisions separated by wide gaps of sea: the most easterly pair, St. Michael and St. Mary; the main cluster of five islands, Pico being the loftiest and Terceira the most important; and the northwesterly pair, Flores and Corvo. These last make a little far-severed world of their own, sharing in none of the tremors and upheavals which from time to time more or less transform parts of the other two divisions. The remote origin of the pair was volcanic, and Corvo is little more now than an old crater lifted about 300 feet above the surface; but the fires have long been dead, and in historic times the lower strata have never shifted suddenly to produce any great earthquake. There have been changes, but they must be attributed for the most part to gradual subsidence.

These two islands, though almost as near to Newfoundland as to any point in Portugal, cannot be classed as American; yet Corvo in particular seems to have impressed the imagination of ancient and medieval explorers with a sense of some special relation to regions beyond, though possibly only to the entangling Sargasso Sea of weeds, which would lie next in order southwestward, and the menacing mysteries of the remoter wastes of the Atlantic. It may have been felt as the last stepping stone for the leap into the great unknown.

ORIGIN OF THE NAME

Flores, the island of flowers, thus prettily renamed by the Portuguese, is referred to as the rabbit island, Li Conigi, in the fourteenth-century maps and records; but Corvo has always borne, in substance, the same name, one of the oldest on the Atlantic. Probably the very first instance of its use is in the *Book of the Spanish Friar*,¹ written about 1350 (the author says he was born in 1305), rather recently published in Spanish and since translated for the Hakluyt Society publications by Sir Clements Markham. After relating alleged visits to more accessible islands of the eastern Atlantic archipelagoes, from Lanzarote and Tenerife of the Canaries to São Jorge (St. George) of the Azores, he continues "another, Conejos [doubtless Li Conigi], another, Cuervo Marinos [Corvo—the sea crow island], so that altogether there are 25 islands."

¹ *Book of the Knowledge of All the Kingdoms, Lands, and Lordships That Are in the World, and the Arms and Devices of Each Land and Lordship, or of the Kings and Lords who Possess Them.* Written by a Spanish Franciscan in the middle of the 14th century. Published for the first time with notes by Marcos Jiménez de la Espada in 1877. Translated and edited by Sir Clements Markham. *Hakluyt Soc. Publs.*, 2nd Ser., Vol. 29, London, 1912. Reference on p. 29.

This account may not actually be later than the Atlante Mediceo map,² attributed to 1351—may even have been suggested by it, as some things seem to indicate. The Friar's voyages are perhaps merely imaginary, their variety and total extent being hardly believable. This very important map has been best reproduced in the collection by Theobald Fischer; on it the same name (Corvi Marinis) seems to be applied to both islands collectively, the plural form "insule" being used to introduce it. Both names are plain on the Catalan map of 1375.³ It is more than probable that they date at least from the earlier half of the fourteenth century.

Possibly the name Corvo had been carried over by a somewhat free translation from the older Moorish seamen and cartographers, who dominated this part of the outer ocean from the eighth century to the twelfth. Edrisi,⁴ greatest of Arab geographers, writing for King Roger of Sicily about the middle of the twelfth century, tells us, among other items, of the eastern Atlantic:

Near this isle is that of Râca, which is "the isle of the birds" (Djazîrato 't-Toyour). It is reported that a species of birds resembling eagles is found there, red and armed with fangs; they hunt marine animals upon which they feed and never leave these parts.

This statement recalls the cormorants, which are supposed to be meant by the sea crows, "corvi marinis" of the later maps. They would naturally flock about the submerged ledges and the wild shore of Corvo and may be held to suggest either the crow or the eagle, though not closely resembling either. Everywhere they are the scavengers of the deep seas. Edrisi mentions a legendary expedition sent by the "King of France" after these birds. It ended in disaster. There is on the Pizigano map⁵ of 1367 a pictorial record of Breton ships in great trouble with a dragon of the air and a kraken, or decapod, on the extreme western border of navigation, which may conceivably refer to this experience.

ANCIENT MEMORIALS

But Corvo has even more ancient traditions and associations. Diodorus Siculus,⁶ in the first century before the Christian era, wrote of a great

² Theobald Fischer: *Sammlung mittelalterlicher Welt- und Seekarten italienischen Ursprungs*, 1 vol. of text and 17 portfolios containing photographs of maps, Venice, 1877-86; reference in Portfolio V (Facsimile del Portolano Laurenziano-Gaddiano dell' anno 1351), Pl. 4.

³ A. E. Nordenskiöld: *Periplus: An Essay on the Early History of Charts and Sailing Directions*, Stockholm, 1897, Pls. 11-14.

⁴ Edrisi's "Geography," in two versions, the first based on two, the second on four manuscripts, viz.: (1) P. A. Jaubert (translator): *Géographie d'Édrisi, traduite de l'Arabe en Français*, 2 vols. (*Recueil de Voyages et de Mémoires publié par la Société de Géographie*, Vols. 5 and 6), Paris, 1836 and 1840; reference in Vol. 1, p. 201; (2) R. Dozy et M. J. De Goeje (translators): *Description de l'Afrique et de l'Espagne par Edrisi: Texte arabe publié pour la première fois d'après les man. de Paris et d'Oxford*, Leiden, 1866, pp. 63-64.

⁵ [E. F.] Jomard: *Les monuments de la géographie, ou recueil d'anciennes cartes européennes et orientales . . .*, Paris, [1842-62]; Pl. X, 1. Also W. H. Babcock: *Early Norse Visits to North America*, *Smithsonian Misc. Colls.*, Vol. 59, No. 19, Washington, D. C., 1913, Pls. 1 and 2.

⁶ The Historical Library of Diodorus the Sicilian, in 15 Books. To which are added the fragments of Diodorus, and those published by H. Valesius, J. Rhodomannus, and F. Ursinus. Translated by G. Booth, Esq., in two vols., London, 1814. Reference in Vol. 1, Bk. 5, Ch. 2, pp. 308-309.

Atlantic island, probably Madeira, which the Etrurians coveted during their period of sea power; but the Carthaginians, its first discoverers, prohibited them, wishing to keep it for their own uses. If the Etrurians were thus well informed concerning one island of these eastern Atlantic archipelagoes, it is a fair conjecture that they had visited the others.

However this may be, it seems that the Carthaginians left memorials on Corvo. At least this is the most reasonable explanation of the extraordinary story repeated by Humboldt⁷ in the "Examen Critique," apparently with full faith in its main feature at least, notwithstanding the fascinating atmosphere of romance and wonder which hangs about the details. In the month of November, 1749, it appears, a violent storm shattered an edifice (presumably submerged) off the coast of Corvo, and the surf washed out of a vault pertaining to the building a broken vase still containing golden and copper coins. These were taken to a convent or monastery (probably on some neighboring island). Some of them were given away as curiosities, but nine were preserved and sent to a Father Flores at Madrid, who gave them to M. Podolyn. Some of them bore for design the full figure of a horse; others bore horses' heads. Reproductions of the designs were published in the *Mémoires de la Société de Gothenbourg*⁸ and compared with those on coins in the collection of the Prince Royal of Denmark. It seems to be agreed that they were certainly Phenician coins of North Africa, partly Carthaginian, partly Cyrenaican.

It has been suggested⁹ that they may have been left by Norman or Arab seafarers, who certainly journeyed among the Azores in the Middle Ages. But, as Humboldt points out, that these should have left a hoard of exclusively Phenician coins, so much more ancient than their own, without even a single specimen of any other mintage, appears very unlikely. On the other hand it is true that Phenician vessels sailing northward in the tin or amber traffic would hardly be likely to be storm-driven so far northwestward as Corvo; St. Michael would have been a more natural involuntary landfall. This objection does not apply, however, if we suppose the deposit to be the work not of accident, but of full intention and deliberation, as the alleged edifice and vault would certainly tend to show. If these coins were deposited by Phenicians who erected permanent buildings, the remoteness of the island would be only an added reason for commemoration. The coins might have been immured in the vault for safe keeping or might have been enclosed in the corner stone, in accordance with the general custom of placing coins and records in the corner stones of notable structures.

Of course these details cannot be confidently accepted. As Humboldt suggests, it is to be regretted that we are without information as to the

⁷ A. von Humboldt: *Examen critique de l'histoire de la géographie du Nouveau Continent*, 5 vols., Paris, 1836-37; reference in Vol. 2, pp. 237-240.

⁸ In Vol. 1. See also *Moedas phinicias e cyrenaicas encontradas em 1749 na ilha do Corvo*, *Arquivo dos Açores*, Vol. 3, pp. 11-113, for some account of Podolyn's discovery.

⁹ Conrad Malte-Brun: *Précis de géographie universelle*, 8 vols., Paris, 1810-29; reference in Vol. 1 of that edition, constituting "L'Histoire de la Géographie," 1810, p. 596.

period or character of the edifice in question. But at least it seems most probable that Phenicians occupied or at any rate visited this island and deposited coins of Carthage and Cyrenaica.

EQUESTRIAN STATUES

Furthermore, Corvo is one of several Atlantic islands reputed to have been marked by monuments generally of one type. Edrisi¹⁰ knows of them in Al-Khalidat, the Fortunate Isles—bronze westward-facing statues on tall columnar pedestals. There are said to have been six such in all, the nearest being at Cadiz. Tradition places an equestrian statue also on the island of Terceira, as repeated in a much more modern work.¹¹ The Pizigano map of 1367, already mentioned, shows near where Corvo should be the colossal figure of a saint warning mariners backward, with a confused inscription declaring westward navigation impracticable beyond this point by reason of obstructions and announcing that the statue is erected on the shore of Atilie. But perhaps the best and most apposite account is that of Manuel de Faria y Sousa in the "Historia del Reyno de Portugal":¹²

In the Azores, on the summit of a mountain which is called the mountain of the Crow, they found the statue of a man mounted on a horse without saddle, his head uncovered, the left hand resting on the horse, the right extended toward the west. The whole was mounted on a pedestal which was of the same kind of stone as the statue. Underneath some unknown characters were carved in the rock.

Apparently the reference is to the first ascent of Corvo after its rediscovery between 1449 and 1460. The mention of "characters" recalls those found in a cave of St. Michael, also by rediscoverers during the same period, as related by Thevet long afterward, most likely from tradition. A man of Moorish-Jewish descent, who was one of the party, thought he recognized the inscription as Hebrew, but could not or did not read it. Some have supposed the characters to be Phenician. There is naturally much uncertainty about these stories of very early observations by untrained men, recorded at last, as the result of a long chain of transmissions: but they tend more or less to corroborate the other evidences of Phenician presence.

It may be possible that the persistent and widely distributed story of westward-pointing equestrian statues marking important islands may have grown out of the ancient mention of the pillars of Saturn, afterward Hercules, and Strabo's discussion as to whether they were natural or artificial in origin; but this puts a severe strain on fancy. We know that the Carthaginians did set up commemorative columns; and that the horse figured conspicuously in their coinage. Nothing in the enterprising character of the Phenician people is opposed to the idea of incitement to exploration westward. It seems easier to believe that they set up these statuary monuments on one island after another than that the whole tradition has grown

¹⁰ Edrisi, *op. cit.* (Dozy and De Goeje), p. 51.

¹¹ S. Morewood: *Philosophic and Statistical History of Inventions and Customs, . . . Inebriating Liquors*, Dublin, 1838, p. 322.

¹² A. von Humboldt, *op. cit.*, Vol. 2, pp. 226-227.

out of a misunderstanding. Such statues might well vanish subsequently as completely as the great silver "tabula" map of Edrisi and many other valuable things of olden time.

Corvo has no statue now; but it is reputed to hold a statue's representative. Captain Boid (1834)¹³ relates:

Corvo is the smallest, and most northerly of the Azores, being only six miles in length, and three in breadth, with a population of nine hundred souls. It is rocky and mountainous; and on being first descried, exhibits a sombre dark-blue appearance, which circumstance gave rise to its present name, whereby it was distinguished by the early Portuguese navigators. It is not known at what period this island was first visited, though from a combination of circumstances, it is supposed, about the year 1460. The inhabitants are ignorant, superstitious, and bigoted, in the highest degree, and relate innumerable ridiculous traditions respecting their country. Amongst other absurdities they state, with the utmost gravity, that to Corvo is owed the discovery of the western world—which, they say, originated through the circumstance of a large projecting promontory on the N. W. side of the island, possessing somewhat of the form of a human being, with an outstretched arm toward the west; and this, they have been led to believe, was intended by Providence, to intimate the existence of the new world. Columbus, they say, first interpreted it thus; and was here inspired with the desire to commence his great researches.

Mr. Boid is wrong in his derivation of the name Corvo, as we have seen; wrong also, another way, in despising the "superstitions" as "absurd" and refusing them record, for they might embody some valuable suggestion. Humboldt thought, however, that the story of the pointing horseman might have grown out of this natural rock formed in human semblance. No doubt this is possible; but it would not account for like stories of the other islands nor the general similitude of their figures. Perhaps an equally valid explanation might be found in the former presence of such artificial figures, leaving a certain repute behind them and causing popular fancy to point out resemblances which would not have been noticed otherwise.

A more recent mention of this pointing rock occurs in "A Trip to the Azores" by Borges de F. Henriques,¹⁴ a native of Flores. He says:

Another natural curiosity which has been defaced by the weather and the bad taste of visitors is a rock resembling a horseman with the right arm extended to the westward as if pointing the way to the new world. Some insular writers deny the existence of this rock.

NEED OF EXPLORATION

There seems still a good deal of vagueness about the matter, and Corvo might well be given a thorough overhauling for vestiges of ancient times. This naturally would be extended to the submerged area close to the shore, for the outlying reefs and ridges may mark the site of lower lands where human work once went on and where its traces and relics may remain. In expanse the island probably was not always what we find it now, six miles in length by at most three in breadth (seven square miles in all, as most accounts compute it) with fringes of rock running off from the shore

¹³ Captain Boid: *A Description of the Azores, or Western Islands*, London, 1834, pp. 316-317.

¹⁴ Borges de Figueiredo Henriques: *A Trip to the Azores or Western Islands*, Boston, 1867, pp. 35-36.

“lifting themselves high above the water in one place, blackening the surface in another, and again sinking to such a depth that the waves only eddy and bubble over them.” Mr. Henriques says elsewhere “In many of the islands, but especially in Flores, there are vestiges clearly indicating that formerly as well as lately parts of the island have sunk or rather disappeared



FIG. 1—Representation of Corvo on fourteenth- and fifteenth-century maps as compared with its present outline.

The sources are as follows: (1) Theobald Fischer, work cited in footnote 2 of the text, Portfolio V, Pl. 4; (2) *ibid.*, Portfolio VII, Pl. 4; (3) A. E. Nordenskiöld: Periplus, Pl. 11; (4) Fischer, *op. cit.*, Portfolio XIII, Pl. 5; (5) Gustavo Uzielli, work cited in footnote 16, Pl. 8; (6) K. Kretschmer, work cited in footnote 17, Pl. 4; (7) Encyclopaedia Britannica, 11th edit., Vol. 3, p. 83.

in the sea.” He cites for instance a notable loss of land in the summer of 1847.

There is reason to believe that Corvo has dwindled in this way much more, proportionately, than Flores. One striking indication is found in the comparison of the present map with those of the fourteenth and fifteenth centuries. For convenience sketches of these are appended. The relative position of the islands is about the same in all. The form of Corvo varies from the pear shape of the Laurenziano map (1351), and another shape not much later slightly resembling an indented segment of a circle, to the three-lobed or clover-leaf form which was accepted as the final convention or standard and first clearly appears in the great Catalan atlas¹⁵ of 1375, repeated by Beccario 1435,¹⁶ Benincasa 1482,¹⁷ and others; but all agree in

¹⁵ A. E. Nordenskiöld, *op. cit.*, Pl. 11.
¹⁶ Gustavo Uzielli: Mappamondi, carte nautiche e portolani del medioevo e dei secoli delle grandi scoperte marittime costruiti da italiani o trovati nelle biblioteche d'Italia, Part II (pp. 280-390) of "Studi Bibliografici e Biografici sulla Storia della Geografia in Italia," published on the occasion of the Second International Geographical Congress, Paris, 1875, by the Società Geografica Italiana, Rome, 1875; reference on Pl. 8 (the second edition, Rome, 1882, does not contain the plates). Also W. H. Babcock, *op. cit.*, Pl. 4.
¹⁷ K. Kretschmer: Die Entdeckung Amerikas in ihrer Bedeutung für die Geschichte des Weltbildes. 2 vols. (text and atlas), Berlin, 1892; reference in atlas, Pl. 4.

making Corvo the main island and Li Conigi (Flores) a minor pendant. Corvo seems in every way to have commanded chief attention, and in size the difference was conspicuous and decisive. The difference certainly is great enough now, but conditions and proportions are reversed. Corvo has but one-eighth the area of Flores and less than one-tenth the population. In all ways it lacks advantages and conveniences, taking rather the place of a poor dependent.

There is no good reason for discrediting so many of the old maps. Their makers sometimes went wrong; but they tried to be accurate and would hardly, through a century or two, persist in making the northern island the greater one unless it was at first really so. Of course the most natural solution of the difficulty is that Corvo's border has sunk or the sea has risen over it, completely drowning the territory which made the lobes or curved outline of the island form in the medieval maps and leaving only above water its rocky backbone, with the crater for a nucleus. Apparently those lobes and their contents are just what might be most profitably dredged for and dived after.

Perhaps the island has not greatly changed since Mr. Henriques wrote his little sketch¹⁸ of it in the sixth decade of the last century:

The first part of the ride to it [the crater] is through steep and narrow lanes walled in with stones. Over those walls you can sometimes see the country right and left, which is divided into small and well-cultivated compartments by low stone walls. These small fields form narrow terraces, one above another, looking from the sea like steps in the hills. An hour's ride brings you to an open mountain covered with heath where browse flocks of sheep and hogs, and about an hour and a half more to the crater on the summit, now a quiet green valley, with a dark, still pond in the center.

The Corvoites, particularly the women, are a happy and industrious people and have strong and healthy constitutions. The men in trade evince a remarkable shrewdness, proverbial among the other Azorians, but in private life their manners are simple and unassuming. They are like a large family of little less than a thousand members, all living in the only village on the island.

¹⁸ Borges de F. Henriques, *op. cit.*, pp. 35-36.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Monthly Meeting of December. A regular monthly meeting of the American Geographical Society was held on Tuesday evening, December 18, at the Engineering Societies' Building, 29 West Thirty-ninth Street. President Greenough presided. He submitted for confirmation the names of 22 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society. Thereupon Mr. Theodoor de Booy of the Museum of the American Indian, Heye Foundation, New York, addressed the Society on "Unknown Parts of the West Indies." Mr. de Booy, whose article on the Virgin Islands of the United States in the November, 1917, number of the *Review* will be recalled, has spent the last eight years conducting archeological investigations in the West Indies. During this time he explored unknown areas in the larger islands and visited many of the smaller islands off the tourists' track. The regions described, and illustrated with colored lantern slides, included the Bahamas, the Cape Maysi district at the eastern extremity of Cuba, the west-central part of Jamaica, the interior of Hayti along the boundary between the two republics composing the island, the Virgin Islands, and Martinique.

NORTH AMERICA

War Activities of the U. S. Geological Survey. The activities of the U. S. Geological Survey during the fiscal year 1916-17 have been concentrated on investigations connected with military and industrial preparedness, as shown by the *Thirty-eighth Annual Report* of the Survey, just made public. These activities have included the preparation of special reports for the War and Navy Departments and the Council of National Defense, the making of military surveys, the printing of military maps and hydrographic charts, and the contribution of engineer officers to the Reserve Corps.

The Survey's investigations of minerals that have assumed special interest because of the war have been both expanded and made more intensive. Special reports giving results already at hand, the product of years of field and office investigation, have been published for the information of the general public or prepared for the immediate use of some official commission, committee, or bureau. Geologic field work has been concentrated on deposits of minerals that are essential to the successful prosecution of the war, especially those of which the domestic supply falls short of present demands. Every available oil geologist is at work in petroleum regions where geologic exploration may lead to increased production. Other geologists are engaged in a search for commercial deposits of the "war minerals"—manganese, pyrite, platinum, chromite, tungsten, antimony, potash, and nitrate.

The war not only diverted practically all the activities of the topographic branch of the Survey to work designed to meet the urgent needs of the War Department for military surveys, but led to the commissioning of the majority of the topographers as reserve officers in the Corps of Engineers, United States Army.

A large contribution to the military service is made by the map-printing establishment of the Survey. This plant has been available for both confidential and urgent work, and during the year has printed 96 editions of maps for the War Department and 906 editions of charts for the Navy Department. Other lithographic work, some of it very complicated, was in progress at the end of the year (*U. S. Geol. Survey Press Bull. No. 347*, December, 1917).

Forest Growth on Abandoned Farms. A hopeful outlook for New England is presented in a recent article by P. L. Buttrick (Forest Growth on Abandoned Agricultural Land, *Scientific Monthly*, July, 1917, No. 1, pp. 80-91). The abandoned farm is "coming back." Deserted because of its unfitness for agriculture, it is, by the natural process of "afforestation," becoming of value for its tree growth. Our Christmas trees come largely from the old-field spruces. The farms abandoned fifty years ago now furnish pulp-wood in considerable quantities. From the young white pines of Massachusetts box-boards are made. The loblolly pines of Maryland and farther south, growing on land where cotton was raised before the Civil War, now yield a large number of trees ten inches in diameter and sixty feet high. They are already a valuable commercial product. The tulip tree, known to lumber men as yellow poplar, grows rapidly on the abandoned

fields of the Southern Appalachians and is a very valuable and a rather scarce wood. Even the stunted scrub oaks, the red cedar and the gray birch, if carefully handled by foresters, can be made productive of lumber. Moreover most of these old-field growths are gradually reverting to the original forest type.

Evaporation from Snow Surfaces in Irrigated Regions. The amount of water evaporated from snow is an important element in any region where irrigation is necessary, and is dependent, wholly or largely, upon the water derived from melting snow. Some field experiments along this line have been made by F. S. Baker, of the Utah Experiment Station (*Monthly Weather Rev.*, Vol. 45, 1917, pp. 363-366). The result of this investigation is that an evaporation of 3 inches is a fair figure for the winter of 1915-16. The winter equivalent of snowfall in the same locality was 21.91 inches. Hence about 14 per cent of the total snowfall was evaporated. The possible effect of forests is briefly considered. It is believed that the shade and the diminished wind velocity due to forests decrease evaporation, but that this effect may be counteracted, at least in part, by the greater area exposed to evaporation by the snow on the branches of the trees. This would be especially true of conifers. R. DEC. WARD.

Influence of the War on the Population Growth of Salvador. In common with its neighbors, San Salvador, distinguished as the smallest and most densely populated of Central American republics, owes its growth of population almost entirely to natural increase. Prior to 1914 the average birth rate was 41.7 per thousand, the death rate 21. In 1915 the difference was far less favorable, and in 1916 the birth rate had dropped to 36.9 while the death rate had risen to 33, leaving a total increase of 4,818 only, the lowest on the demographic register. The high number of deaths is attributed to the abnormal increase of malaria and this in turn is explained by the high price of quinine and other drugs. Thus, as the Director General of Statistics remarks (*Anuario Estadístico de 1916*, Direcc. Gen. de Estadística, San Salvador, 1917), do even the populations remote from the European War feel the retrogressive action of the great conflict.

EUROPE

The Situation of the Steel Industry in Great Britain. The industrial development of Britain commenced under favorable geographic conditions. The Coal Measures supplied not only fuel but also ore for the manufacture of wrought iron. With the coming of the steel age in the second half of the nineteenth century the situation became somewhat less favorable; costly processes of refinement demanded another form of ore, the Bessemer "acid" process of steel making being dependent on the use of a pure hematite. The distribution of ore of this grade is restricted in Britain. The Cumberland mines yield a hematite amongst the richest and purest in the world, and, as regards money value, the production of these mines stands first in the domestic supply, but it is not unlimited and the working is expensive. The British lead in steel production was maintained through importation of the raw material, a method that could be profitably followed by reason of the accessibility and productivity of the coalfields and the high organization of the merchant marine. In particular Bilbao, with quarries near the sea, became the leading source of imported ore. At present, though the Bilbao mines are nearing exhaustion and recourse must be had to less accessible deposits, Spain still contributes a major share, in 1913 not less than 60 per cent of the British import.

The eighties of the last century saw the beginning of the great steel industry of the Rhineland. Germany's coalfields, however, do not occupy so favorable a location as those of Britain, nor could Germany enjoy the same command of foreign markets for hematite. On the other hand, within easy reach were the vast iron deposits of Lorraine, estimated to hold 5,000,000,000 tons of ore. From the southern tip of Belgium to the south of Metz and Nancy the Jurassic ironstone formation runs along the political frontier. Before the war over three-quarters of the German iron-ore output and nearly nine-tenths of the French production came from within ten miles of the boundary. On the German side the Saarbrücken coalfield lies in close proximity. The ore, however, is phosphoric and unfit for steel making by the Bessemer process. Germany turned towards the "basic" process, whereby is obtained a grade of steel inferior but yet satisfactory for most constructional purposes and cheaper. Thus Germany, whose steel output at the beginning of the century was hardly equal to that of Britain, is now producing more than all the Allies put together except America. Britain has kept her place in the world's supply only in respect of high-grade tools and special steel alloys. In America the same tendency appears. Though great reserves of hematite are untouched, it is found more profitable to work the low-grade phosphoric ores near the developed lines of transportation, and the production of basic steel is assuming more and more importance.

In the manufacture of acid steel Britain is therefore unique. That she has so far been able to maintain it is due in large part to the geographical circumstances suggested above, marine supremacy, character and location of the coalfields. Already more than half the raw material of the industry comes from abroad. As the readily accessible deposits of hematite become exhausted this dependence may not be profitably sustained. But there is an alternative to costly importation in utilization of the home supply by the basic process. The Jurassic rocks of Britain, like those of Lorraine, are rich in phosphoric ore. In Cleveland (the northern end of the Jurassic escarpment) such ores have been worked for many years; indeed the basic process subsequently developed by Germany originated here. Besides the Cleveland deposits there are others favorably situated in regard to the eastern coalfields which are also well placed for importation of the foreign low-grade ores of northern France or Scandinavia. Thus might arise a locational differentiation of the steel industry; the west maintaining the output of high-grade material, while the east developed the cheaper basic product (W. G. Fearnside: *The Shortage of the Supply of Non-phosphoric Iron Ore*, *Journ. Roy. Soc. of Arts*, Sept. 28, Oct. 5, and Oct. 12, 1917; abstracted in *Nature*, Nov. 22, 1917).

The Population of Spain. According to estimates made by the Instituto Geográfico y Estadístico of Madrid the population of Spain on December 31, 1916, was 20,747,893 (*Rev. de Geogr. Colon. y Mercantil*, Vol. 14, 1917, No. 5-6, pp. 174-175, Real Soc. Geogr., Madrid). This is a gain of 116,983 since December of the preceding year. One notable feature of the estimate is that in eleven of the forty-nine provinces there has been a decrease since 1915. Of these eleven, six provinces show a loss from the estimated population in 1914, and three have fewer inhabitants than in 1910. A comparison of recent statistics as given in the last issues of the "Statesman's Year Book" shows that this condition is not due to emigration, for in 1914 and 1915 less than half as many people emigrated from Spain as in the two preceding years. Economic conditions in Latin America discouraged Spanish immigration into the New World. The explanation of the loss in population in some of the Spanish provinces seems rather to be found in the decided gain made by other sections of the country. Madrid, Valencia, Barcelona, and the Canary Islands show a rapid growth in the last few years. These places are centers of industry and commerce, while the regions where loss of population is recorded depend upon agriculture and viticulture. Except in a few favored districts such as the *vega* of Valencia and the valley of Seville, an unproductive soil coupled with primitive methods renders farming an unprofitable occupation. Large areas in northern Spain where grape growing was formerly the principal industry have suffered from the invasion of the American grape louse. These conditions are accelerating in Spain the movement of population toward industrial and commercial centers, creating a denser population in the regions already most thickly populated and drawing people away from regions where density is already least.

AFRICA

The Climate of German East Africa. A study of the climatology of German East Africa, by Major H. G. Lyons, F.R.S., appears in a recent number of the *Quarterly Journal of the Royal Meteorological Society* (Vol. 43, 1917, pp. 175-195). The discussion is especially timely because of the interest in the region as one of the recent theaters of war and because so little accurate information is available in regard to that particular district. The climatic data for German East Africa have usually been published in the official publications dealing with the German colonies (*Mitteilungen aus den deutschen Schutzgebieten*, Berlin, 1888-1912), and there have also been published several summaries and discussions of these data by prominent meteorologists. The colony lies between Lakes Tanganyika and Nyasa on the west and the Indian Ocean on the east and extends from near the equator to about latitude 10° S. It has low coastal plains on the shore of the Indian Ocean, the hill regions of Usambara in the northeast, of Iringa in the southeast, and of Langenburg in the south. To the westward lies the great plateau of the interior. By reason of its position near the equator most of the colony receives heavy tropical rains in the wet season. When the drier northeasterly and southeasterly air currents sweep over it, dry seasons occur, which, in some parts, last several months and are of considerable aridity. In places there are two well-marked maxima of rainfall, with a minor dry season between them, as in Uganda. The coast, which has its winds directly from the Indian Ocean, naturally receives a heavier rainfall than many parts of the interior.

In the coastal belt the hot, damp days and nights, especially from December to February, are very trying to Europeans. For days at that season the temperature may never fall below 80° F. Rain falls in every month, the maximum coming in March-May. The amounts are large. Coconut palms, sugar cane, aloes, bananas, and mangoes flourish.

The Usambara hills, in the northeast, have the advantage of elevation. At the higher altitudes, above the forest, many European plants can be cultivated, and persons whose health has deteriorated on the hot, enervating coast may regain strength and vitality. Kilimanjaro shows a beautiful series of vertical climatic zones. Bananas are cultivated on the lower slopes, and lately coffee and maize are being raised. Above the forest zone are the grass slopes, where large herds of sheep and cattle can graze. At still higher levels the vegetation becomes sparser and assumes an alpine character. The inland plateau (4,000-5,000 feet) has a long, hot dry season from May to October. This gives the greater part of the interior its character of savana forest, often passing into thorn forest. The end of the dry season brings the highest temperatures, even reaching 100°, in spite of the altitude. The rainfall is generally very moderate in quantity (December-April). This plateau is mainly a pastoral region.

The lake district has a moister climate than the plateau. The wet season is primarily March, April, and May. A minor rainy season, in November and December, continues in some parts through January and February. As the result of the plentiful rainfall and of the hot, equable climate, luxuriant vegetation flourishes.

R. DEC. WARD.

The Economic Future of French North Africa. In a recent paper (Problems of French North Africa, *Journ. Roy. Soc. of Arts*, June 8, 1917), Captain Philippe Millet, colonial editor of *Le Temps*, Paris, depicts the present situation in Algeria, Tunis, and Morocco and outlines the problems that confront France in its future dealings with these countries on the Mediterranean border of Africa.

Captain Millet spoke of these countries as really forming an island, being bounded on the east, north, and west by the sea, and on the south by the desert. We know that this conception of the isolation of these countries is as old as the early days of the Roman occupancy of North Africa. One day a Roman saw from a mountain top in Algeria an undulating surface, far away to the south, which he believed was the sea. It proved to be a sea of sand, isolating Roman Africa more effectively than did the waters on the other borders.

In the time of the Roman Empire, French North Africa was really a part of the European system. This tie was finally broken by Islam, but France has revived the old relation. The present connection between the northern and southern Mediterranean shores is becoming closer every day. The man who sails from Marseilles at dawn sees the next dawn at Algiers. These African lands, so near Europe, are in resources among the richest in the world. The continuous growth of harbors and cities, Algiers and Oran, for example, is evidence of great economic development. Though Morocco is only beginning to develop its resources, the total trade of French North Africa amounted, before the war, to a little over \$360,000,000 a year, over half of which represented trade between North Africa and France, the mother country. Moreover, the present wealth of this African France is still small compared with what it will become. The area of its farm lands is equal to all the arable land of Italy and Spain together, and not over a fourth of it is yet under cultivation. The mineral wealth seems to be equally important, not only in Algeria, where the great iron deposits of the Uezzan region are still untouched, but probably in Morocco also. In a word, North Africa has unlimited possibilities such as give an old nation like France indefinite outlet for its economic energy.

The census of 1911 showed 800,000 Europeans in Algeria alone, of whom 500,000 were French citizens. There are 50,000 Frenchmen in Tunis and 40,000 in Morocco. Many of these people are French, not by birth but by naturalization. France is absorbing in North Africa new European blood, chiefly Spanish and Italian, exactly as the United States turns into American citizens thousands of immigrants from abroad. It is a significant fact that in 1912 the French elementary schools in Algeria contained, besides 75,000 French children, 44,000 children of foreign nationality. Nearly all the European children are educated in the French schools. In a generation or two they will be a part of the French nation.

It is a noteworthy fact, also, that the French birthrate in Algeria is very high, thus providing France with additional new blood which she does not find in the ranks of her home population.

The native element, being Mohammedan, has much in common with the Egyptians and does not easily understand French ways. It is doubtless fortunate that among the whole native element of Algeria, estimated at ten or eleven millions, about nine-tenths are pure Berbers. In other words, they are of ancient white stock and may be regarded as intermediary between the Arabs and the Europeans of Algeria. Thousands of the Berbers have been in the habit of going to France, where they work in factories and wear European clothing. Over 270,000 of these North Africans are now soldiers fighting in Europe under the French colors. Thus this African France, still in its infancy, is adding substantial strength to that of the old country.

CYRUS C. ADAMS.

ASIA

Japan, the Commercial Focus of the Pacific. A list of the chief Pacific ports ranked according to their foreign trade in 1916 is given in *Commerce Reports* for October 31, 1917. Excluding Hongkong, of which complete official statistics are not kept, the ports with an annual trade exceeding a million dollars are: Yokohama, \$353,000,000; Kobe, \$352,000,000; Shanghai, \$348,000,000; Singapore (1915), \$273,000,000; Sydney (1915), \$257,000,000; San Francisco customs district, \$209,000,000; State of Washington customs district, \$300,000,000. Most significant is the position of the Japanese ports. They exhibit the results of an enormous industrial and commercial progress during the war. Industrially Japan has profited both by the increased call for her old-time products, textiles for instance, and the new demand for war materials. Demands have grown in the old-established markets—imports from the United States have doubled; Chinese needs have created a boom trade in bar silver, and markets practically new have been opened up—exports to South Africa increased by 400 per cent between 1915 and 1916 (*Suppl. to Commerce Repts. No. 55a*, Aug. 28, 1917, and *Commerce Repts.*, Feb. 5, 1917; see also *ibid.* for March 31, 1917). Trade expansion has been fostered, indeed rendered possible, by the parallel progress in the establishment of a mercantile marine. In July, 1914, there were three great shipping nations in the Pacific: Britain, Japan, and the United States. Two years later Japan was entirely master of the situation. Britain was outmatched, while the tonnage (gross) carried under the United States flag was reduced from 80,000 to 5,000! Japanese tonnage had made a considerable absolute increase (Abraham Berglund: *The War and Trans-Pacific Shipping*, *Amer. Econ. Rev.*, Sept., 1917).

Of Japan's ports Kobe, outlet for the busy and productive region round the eastern end of the Inland Sea, has made the greatest advance. Figures for the first seven months of 1917 show Yokohama, heretofore the first port, completely outranked by Kobe. It is improbable that the trade of Hongkong approaches that of the Japanese port; so Kobe may justly claim to be the first port of the Pacific in foreign commerce.

AUSTRALASIA AND OCEANIA

The Settlement of Tropical Australia. Dr. Griffith Taylor, of the Commonwealth Bureau of Meteorology, has lately given considerable attention to the climatic controls of human settlement, with special reference to Australia (see the review on p. 86). In a recent discussion of the settlement of tropical Australia (reprint, *Melbourne Herald*, no date), Dr. Taylor deals with the season and "reliability" of the rainfall and with the wet-bulb temperatures as two critical factors in determining human settlement and human occupations. A chart is given showing that as regards the reliability of the rainfall over the eastern portion of the Barkly Tableland—a valuable grazing area in the Northern Territory—the average "deviation" (departure from the normal) is nearly 50 per cent. This condition, which implies that here the rainfall may be anywhere between 12 and 37 inches, is not, in the opinion of the author, suited to economic wheat-growing. Dr. Taylor adopts 70° wet-bulb temperature "as the limit of comfort for our race." This means that when the mean wet-bulb readings average 70° for a long time the climatic conditions are not suitable for close white settlement. On the other hand, open-air occupations, like stock raising, may be successfully followed. The duration of wet-bulb readings of 70° is shown for Australia by lines. These lines represent a duration of from twelve months at Thursday Island, in the extreme north, to two months at Brisbane, and no months over about half of southern Australia. The six-months duration of 70° wet-bulb readings is believed to be "a definite climatological boundary." Locally the unfavorable conditions are ameliorated by other factors, such, for example, as the southeast trades on the Queensland coast. Dr. Taylor's conclusion is that the empty northern lands of Australia are pastoral, not agricultural. They are not suitable for white labor *at present*, although a gradual acclimatization process may fit future generations of white men and women for residence there.

R. DeC. WARD.

HUMAN GEOGRAPHY

The Desert Aridity of Heated Houses. The relative humidity of an ordinary heated house during the colder months approximates that of desert air. The indoor "climate" has become thoroughly artificial. We live, for most of our northern winters, in calm, "dead," desiccating air. This subject has been investigated by several writers, some of the early discussions being by R. DeC. Ward in the *Boston Medical and Surgical Journal*, March 1, 1900, and in the *Journal of Geography*, September, 1902, and by Mark

Jefferson in the latter journal, December, 1902. A further contribution to the matter has been made by S. D. Flora of the U. S. Weather Bureau at Topeka, Kan. (*Monthly Weather Rev.*, Vol. 45, 1917, pp. 231-233). The observations were made indoors and outdoors during November and December. The mean relative humidity indoors was 28.4 per cent, that outdoors, 77.6 per cent. The corresponding mean temperatures were 73.2° and 33.9°. The question of raising the humidity indoors is not as simple as it seems. The amount of water required for evaporation is large, and, if the air becomes too damp, moisture will condense on windows and on painted walls in cold weather. The rational solution of the problem is to keep rooms and houses from being excessively heated, for higher temperatures mean greater capacity for water vapor; to provide for a certain amount of evaporation; and to maintain good ventilation.

In connection with the physiological effects of dry indoor air some observations made by Professor E. L. Thorndike and P. J. Kruse of conditions in schools are noteworthy (*School and Society*, Vol. 5, 1917, pp. 657-660). Two divisions of a sixth grade of 43 pupils each, of equal initial ability, were treated alike in every respect except in regard to the dryness of the schoolroom. The "dry" group worked in a relative humidity averaging 28.7 per cent. The "moist" group were in a room whose humidity averaged 42.2 per cent. The temperature was alike for both groups, about 67.4° F. The two groups were carefully tested, with the result that there is "no demonstrable effect of relative humidity on the intellectual progress of schoolchildren. What slight difference there is favors the dry condition." The conclusion is that there is no likelihood that the humidification of schoolrooms during the winter will improve the mental work of the children.

Professor E. G. Dexter ("Weather Influences," 1904) some years ago found that schoolchildren showed an excess of demerits for low humidity as compared with those for moist air. The inference was that restlessness increased in drier air. The stimulating, nervous effects of dry air are well known, as are the quieting effects of damp air, especially when warm.

R. DEC. WARD.

GEOGRAPHICAL NEWS

Founding of the Cortes Society. Interest in Latin America has found new expression in the recent formation of "The Cortes Society" with offices in the Museum of the American Indian, Heye Foundation, Broadway at 155th Street, New York. The purpose of this new society is to publish documents and narratives dealing with the discovery and conquest of Latin America. Its aim will be to make available to the English reader unpublished manuscripts and accounts never before translated. In this it will do work similar to the Hakluyt Society, but in a special field. The undertaking should have a wide appeal, for some of the works of the early Spanish explorers, products of Spain's glorious literary past, dealing with a theme that was of all-absorbing interest at the time, make extremely entertaining reading today. As contributions to geography such volumes as those just published, the "Narrative of Some Things of New Spain and of the Great City of Temestitan, Mexico, written by the Anonymous Conqueror, a Companion of Hernan Cortes," translated by Marshall H. Saville, and "An Account of the Conquest of Peru, written by Pedro Sancho, Secretary to Pizarro and Scrivener to His Army," translated by Philip A. Means, are of great value, for both give descriptions of the land and people in regions that offer most striking examples of how physical environment has influenced the development of human culture. Works which will follow during the year 1918 will include the "Misfortunes of Alonzo Ramirez, by Siguenza y Gongora," translated by George Parker Winship, the "Itinerary of Grijalva," translated by Marshall H. Saville, the "Narrative of the Discovery and Conquest of the Kingdoms of Peru, by Pedro Pizarro," translated by Philip A. Means, and the "Account of the Conquest of Mexico, by Andres de Tapia," translated by Randolph M. Saville.

The Cortes Society has a membership of about eighty individuals, as well as societies and libraries, whose interest in Latin America is literary, scientific, and historical. There are no dues, a member's only obligation being to subscribe to the publications of the Society. The following are the officers: President, F. W. Hodge, Bureau of American Ethnology, Washington, D. C.; Vice-President, General Hugh L. Scott, War Department, Washington, D. C.; Secretary and Treasurer, Marshall H. Saville, Museum of the American Indian, Heye Foundation, New York; Council: the above officers and George Parker Winship, Harry Widener Memorial Library, Harvard University, Cambridge, Mass., and Philip A. Means, Harvard Club, Boston, Mass.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

GENERAL

Indian population in the United States and Alaska, 1910. 285 pp.; maps, diags.
Bur. of the Census, Dept. of Commerce, Washington, D. C., 1915.

This volume deserves more than passing notice, for it is the result of the first attempt to secure through the census special data concerning the Indians as a separate element of the population. While the Department of Indian Affairs has for many years kept a roll of all Indians under its charge, these data were never subjected to systematic treatment or even made readily available to the public. Frequently one meets with these legitimate inquiries: Is the Indian steadily dying out under the economic and physiological pressure of our own culture, or is he holding his own? To what extent is he being assimilated, and what are the observable effects of race mixture with whites? The volume before us may be said to be the first discussion of these problems from the standpoint of systematic data.

The census returns show a total of 265,683 Indians in the United States and 25,331 in Alaska. Every state in the Union returned some Indians, but their distribution varies: Oklahoma leads with something more than one-quarter of the whole, while Arizona, New Mexico, South Dakota, California, Washington, Montana, and Wisconsin together account for one-half. These and other facts of distribution are shown not only by convenient tables, but by sketch maps and diagrams. As compared with the enrollment of the Department of Indian Affairs, there has been an increase of 7 per cent since 1890 in the United States, but a decrease in Alaska of 23 per cent, though in this case the data are far less reliable. As noted in the text of the report (p. 10) some allowance must be made for mixed marriages, since all offspring of such unions are counted as Indians; but even so there is no reason for assuming that the Indians of the United States are dying out. Furthermore, the chapter on age distribution shows that one-eighth of the population exceeded fifty years—a fair longevity.

However, one of the chief features of the report is the status of the mixed-blood. Thus, in the United States these full-bloods, as enumerated, were 56.5 per cent of the total and the mixed-bloods 35.2 per cent. For 8.4 per cent of the returns no data as to blood were given. Of the mixtures, 88,030, or 33.1 per cent, were with whites, of which 27.7 per cent were the offspring of marriages between full-blood Indians and whites, while of the residue 49.9 per cent of the total were more than half white. Thus, it is clear that the tendency is for those of partial white descent to marry white instead of Indian. Unfortunately the reports do not give us the character of the white-Indian marriages, but it is generally assumed that few white women marry full-blood Indians, the rule being for the reverse, so that the true half-breeds are the offspring of white men and Indian women. Reverting to our main topic, it is clear that the Indian is in a fair way of being absorbed by the whites.

Naturally the respective tribal groups differ in the amount of race mixture. Thus the Hopi, Navajo, and Zuñi are practically free from all mixtures; while the St. Regis and Croatan are less than 10 per cent pure-blood; and even the well-known Cherokee are but 22 per cent pure. On the whole, the purest groups are found in New Mexico and Arizona, but outside these states there appears no variation concomitant with geographical position. On the other hand, there is a correlation between the amount of mixture and cultural condition, since those tribes that have resisted most successfully the modification of their old modes of life are precisely the ones that lead in purity of blood.

The classification of mixed and full-bloods by ages reveals an excess of young people among the former; but this cannot be interpreted as wholly due to differences in the death rate for each class, for the data upon fertility show that sterility decreases steadily with the amount of white blood in the parents. Thus, while among full-bloods 10.7 per cent of marriages were without issue, among "the marriages of full-bloods with mixed-bloods, where less than one-half of the blood was white, the percentage of sterility was 8.8; for the marriages of full-bloods with whites, where one-half of the blood was white, the proportion of sterility was 7.7 per cent.; for the marriages between mixed-bloods, where the proportion of white blood may have varied considerably but was probably

one-half or more, sterility was shown in 7 per cent of the cases; and finally, for marriages of mixed-bloods with whites, where more than one-half and often three-fourths or more of the blood was white, the percentage of sterility was only 5.8. Thus an inverse relation between the amount of white blood in the married couple and the proportion of childless unions seems to be established by the percentages. Furthermore, when the number of children is considered the mixed-bloods lead, but the marriages in which negro blood is found lead those with white blood. In some respects this excess of mixed-blood children is the most important point in the whole report, especially since an analysis of the vital data for these children shows that those of mixed-blood have greater chances of life. Hence, "the results of studies on sterility, on fecundity, and on vitality all point toward one conclusion, and that is that the increase of the mixed-blood Indians is much greater than that of the full-blood Indians, and that unless the tendencies now at work undergo a decided change the full-bloods are destined to form a decreasing proportion of the total Indian population and ultimately to disappear altogether."

It is a matter of no small significance that more than 60 per cent of all male Indians over ten years of age were engaged in gainful occupations and of these about 80 per cent were farmers or stock raisers. But 45.3 per cent of Indians are illiterate and but 31.3 per cent of those over ten years of age were unable to speak English. About three-quarters of the Indians are tax payers. These and many other facts of interest are made plain by tables and diagrams, all of which show the rapid march of cultural and racial assimilation.

Yet the most distinctive feature of the book remains to be noted—its grouping of all Indians according to their tribal and linguistic classifications. One of the great triumphs of American anthropology is the perfecting of a complete list of Indian linguistic families and the identity and habitat of the tribal divisions under each. All the statistical tables in this report are so classified as to show the returns for each of these tribal divisions and their distributions by states and counties. The explanatory text gives in alphabetical order a brief statement of the linguistic and geographical position of each recognized tribe; and, as this is an up-to-date and accurate compilation, this part of the volume stands as the best reference handbook on the subject. Fifty-two linguistic families are represented, embracing in all about three hundred and fifty tribal divisions. The data are so tabulated as to show the full condition of each tribe and the places of residence for all its members. Finally, a revised edition of the Powell linguistic map of North America on the scale of 1:15,000,000, is appended. Many editions of this map have been issued by the Bureau of American Ethnology since its first appearance in 1891, and there are few prominent anthropologists in the United States who have not at one time or another had a hand in its revision. Hence, as it stands, this map is the latest and most authoritative presentation of the linguistic distribution of Indian tribes in the sixteenth century and is one of the most important ethno-geographical contributions of our time. Some differences of opinion will always exist as to the exact limits of many of the linguistic areas designated on this map, but in the main positions all students are now agreed. Since the Indian seldom recognized very exact boundaries to his hunting lands or fully respected the claims of his neighbors, the precise boundaries upon the map should be taken as approximate.

CLARK WISSLER.

UNITED STATES

North Atlantic States

— **New England, A handbook of: An annual publication.** 843 pp.; maps, ills., index. (Sargent's Handbook Series.) Porter E. Sargent, Boston, 1916. \$2.50. 7½ x 5.

This is a book for the automobile tourist, not to help him find his way, but to assist him in getting real pleasure and satisfaction from his visits to the towns and cities that are connected by the most frequented automobile routes. The volume includes twelve introductory chapters dealing with the general features of New England, fifty-seven route descriptions, and a series of directories of ferries, hotels and tea rooms, schools, camps, etc. The description of each town takes up in general its location, its sites of interest, and the historical and literary events associated with it. This portion of the volume has been done with great care. Only occasionally is an item included that good taste would have suggested should be omitted. Any visitor to New England will find these descriptions most helpful and satisfying. Indeed it would be a poor tourist who would not be led from his beaten path by the alluring descriptions of little-advertised places.

The general chapters deal with the surface, climate, flora, and aborigines; with the New Englander, his language, the New England village, roads and highways, New Eng-

land architecture, and the several states. These chapters are very unequal in character. The geological chapter is too technical for a layman, the chapter on New England climate is flippant and inadequate. The introductory chapter on "New England in the Large" and the chapters on the flora, on the language, and on the New England village are dignified and helpful, perhaps the best sections of this portion of the book. Taken as a whole the volume is worth while even to a New Englander, but every New Englander will regret the frequent sarcastic and would-be humorous interspersions that detract so much from the quality of a needed volume. The promised later edition should include more maps, especially local maps, and exclude many crudities hardly to be excused even in a first edition.

R. E. DODGE.

GREGORY, H. E., AND A. J. ELLIS. **Ground water in the Hartford, Stamford, Salisbury, Willimantic, and Saybrook areas, Connecticut.** 150 pp.; maps, diags., ills., index. *U. S. Geol. Survey Water-Supply Paper 374.* Washington, D. C., 1916.

GROVER, N. C., C. C. COVERT, C. H. PIERCE, AND G. C. STEVENS. **Surface water supply of the United States, 1914. Part I: North Atlantic slope drainage basins.** 195 and xxxvii pp.; ills., indexes. *U. S. Geol. Survey Water-Supply Paper 381.* Washington, D. C., 1916.

HADIDA, M., edit. **Guia de New York para los turistas hispano-americanos.** 120 pp.; ills. Agencia de Touristas Latino-Americanos, New York, 1916. 25 cents. $7\frac{1}{2} \times 4\frac{1}{2}$.

HARPER, R. M. **The natural vegetation of western Long Island south of the terminal moraine.** Reprinted from *Torreya*, Vol. 17, 1917, No. 1, pp. 1-13.

HARSHBERGER, J. W. **The New Jersey pine barrens.** Ills. *Amer. Museum Journ.*, Vol. 17, 1917, No. 4, pp. 245-252.

JOHNSON, CLIFTON. **New England: A human interest geographical reader.** xii and 371 pp.; map, ills., index. Macmillan Co., New York, 1917. \$1.00. $7\frac{1}{2} \times 5$.

North Central States

BLAIR, W. R. **Free-air data at Drexel Aerological Station: January, February, and March, 1916.** 59 pp.; diags. *Monthly Weather Rev. Suppl. No. 5.* U. S. Dept. of Agriculture, Washington, D. C., 1917.

The rapidly increasing importance of aviation, in war, and, after the war, in peace, puts more and more emphasis upon the need of securing reliable data from the free air. The Weather Bureau, at its aerological station at Drexel, Nebraska, is carrying on systematic work in the exploration of the air. The present publication, which bears the sub-title *Aerology No. 2*, gives the complete data for January, February, and March, 1916. There is a brief introductory statement, and six diagrams show the distribution of the free-air temperatures above Drexel during six different periods of observation. Later on, when air routes are regularly followed by a commercial airplane service, these data from Nebraska will prove their practical usefulness.

R. DEC. WARD.

— **Rosenwald Hall, Four addresses at the dedication of.** *Univ. of Chicago Mag.*, Vol. 7, 1915, No. 6, pp. 175-181. [Rosenwald Hall is the new home of the Departments of Geology and Geography of the University of Chicago. The four addresses are: "Some Matters of History" by R. D. Salisbury; "The Earth Sciences and Education" by Eliot Blackwelder; "The Earth Sciences and Government" by F. W. DeWolf; and "The Earth Sciences and Culture" by W. W. Atwood.]

EUROPE

THE LOW COUNTRIES, LUXEMBURG

BEEKMAN, A. A. **Nederland als polderland.** 2nd edit. xii and 475 pp.; maps, diags. W. J. Thieme & Cie, Zutphen, [1915?]. 9×6 .

This work not only is one of the few works in existence that deal with the intricate system of the reclaimed lakes, riverbanks, and seashores of the Netherlands but can be said to cover the subject undertaken so thoroughly that later students and authors will constantly be forced to use it for reference. It would be hard to give a literal English translation of the title. *Polder* means a "drained marsh" and *polderland* should mean "land formed by the draining of marshes." Not all reclaimed land in the Netherlands, however, was formed from marshes and lakes; considerable areas were redeemed by the control of river courses and even by fighting the sea for supremacy.

As an officer of the Engineer Corps of the Dutch Army, Dr. Beekman not only had every opportunity of studying the reclaimed areas of the Netherlands but brought out,

thirty years ago, a first edition of the work under review. In the introduction of this second and greatly enlarged edition he deplores the ignorance of the Dutch themselves of the methods by which the more important part of the Netherlands has been formed and the means by which these same lands are protected from their ever-present enemy, water. With the small neutral country of the Netherlands in constant apprehension from a German invasion, it is interesting to be able to study, in Dr. Beekman's book, the means that could be employed to inundate certain parts of the country in order to form an aqueous border against an invading host.

The author has divided the entire Netherlands into districts according to their geological features and begins the description of each district with a thorough historical study showing the exact area before reclamation and the gradual victory of man. Not only are these data valuable to the expert in hydraulics, but the historical student finds here an explanation of the seemingly arbitrary boundaries of the Dutch provinces and exhaustive information regarding the obscure origin of many place-names, especially of those ending in *sluis*, *sloot*, and *dam*, these endings meaning "sluice, or lock," "ditch," and "dam."

After an historical dissertation on each district, the author describes at length the means that were employed in draining or reclaiming and gives statistical figures showing in each instance the exact area of land that was gained, its depth below sea level, its agricultural possibilities in relation to its geology, and the manner in which its waterways connect with the canal system of the surrounding country.

The earliest type of windmill as well as the latest type of centrifugal pump are described, with their application to the many problems of the Dutch drainage systems. This machinery is, of course, used only in the reclamation of lakes and marshes. But the means by which the Dutch curb their rivers and make them narrower by a system of dams, thereby gaining large areas of dry and extremely fertile land, are also described in detail: so also are the methods used, by the building of enormous dikes, not only to prevent encroachment of the sea, but to form new land by the very action of the sea itself.

The student of early man in Europe can gain much from a perusal of Dr. Beekman's book. Before Germany was settled, the Netherlands were inhabited by the Batavians and the Frisians. These rude, paleolithic tribes erected the various types of hummocks found throughout certain provinces of the Netherlands to serve as a protection against the rise of the surrounding waters, in very much the same manner as the Apalachees built their mounds in the Everglades of Florida. And even in historical times, Dr. Beekman tells the reader, a sudden rise in water level due to the breaking of a dike has sometimes forced the inhabitants to take up their abode on one of the so-called "shelter-hills" built during the Roman occupation.

Dr. Beekman's text alone would be a welcome addition to our scant knowledge of the subject with which he deals. But, in addition, he furnishes us with numerous valuable maps. A general map of the Netherlands, 1:600,000, shows the drainage basins (with profiles showing the gradients of the principal rivers). Two maps, 1:275,000, show the polder systems of the province of Holland in great detail, while a map of the Dollart, the estuary of the Ems, illustrates the contest of sea and land in that region. Several small maps represent conditions in the early Middle Ages in various regions of interest, and there is a valuable inset, 1:100,000, showing the present and past channels of the lower Rhine.

The only criticism to be made is that the work has not been indexed, having merely a table of contents, which, of course, is of no material aid to one wishing to consult a special point.

THEODOOR DE BOOY.

EASTON, C. *Het Dordtsche probleem (de vroegere loop der rivieren bij Dordrecht)*. Maps. *Tijdschr. Kon. Nederl. Aardrij. Genoot.*, Vol. 34, 1917, No. 1, pp. 1-37.

GALLÉ, P. H. *De storm van 13-14 Januari 1916*. Maps. *Tijdschr. Kon. Nederl. Aardrij. Genoot.*, Vol. 33, 1916, No. 3a, pp. 351-363.

— *Handelsbeweging, De, der buitenbezittingen in 1914*. Part I: *Met het Buitenland*. 41 pp. Part II: (a) *met Java*; (b) *met andere gewesten der buitenbezittingen*; (c) *Afzonderlijke beschouwing van enkele producten der buitenbezittingen*. 139 pp. *Mededeelingen van het Bur. voor de Bestuurszaken der Buitenbezittingen, bewerkt door het Encyclopædisch Bur.*, No. 9. Filiaal Albrecht & Co., Weltevreden, and G. C. T. van Drop & Co., The Hague, 1915. Each Fl. 1.50. 11 x 9. [Trade with the Dutch colonies.]

— *Belgium*. 1:100,000. Sheets: No. 1 A, Dunkerque; No. 2, Ghent; No. 5, Tournai (2nd edit.); No. 5 A, Hazebrouck (2nd edit.); No. 12, Valenciennes (2nd edit.).

Geographical Section, General Staff, War Office, London, 1915-16. [Sheets of a topographical map which is a product of the war. Drainage in blue, contours (interval, 10 meters) in brown, woods in green, roads in red, towns in black.]

AFRICA

GENERAL

WALKER, H. F. B. *A doctor's diary in Damaraland*. vii and 207 pp.; map, ills. Edward Arnold, London, 1917. 7s 6d. 9 x 5½.

WHITTALL, W. *With Botha and Smuts in Africa*. 279 pp.; maps, ills. Cassell & Co., Ltd., London. 6s. 8 x 5½.

YOUNG, F. B. *Marching on Tanga (With General Smuts in East Africa)*. xii and 265 pp.; map, ills. W. Collins Sons & Co., Ltd., London, 1917. 6s. 8 x 5.

There is an absorbing quality in these three personal narratives: its basis lies largely in their effective portrayal of the distinctive geographical aspects of the campaigns. This is the scene of the campaign in German Southwest Africa described by Commander Whittall: "Hundreds of miles of stark desert, almost waterless and without vegetation save for occasional patches of poisonous 'milkbush' scrub; poisoned and polluted water-holes and mine-strewn tracks; scorching sun by day and frost at night; flies that were like the Egyptian plague, sand that was like marching in deep snow and, where the sand was not, rock that cut the stoutest of boots to ribbons in a week." It is an epitome of the geography of a large area of Southwest Africa.

All three writers are naturally concerned for the most part with the inimical aspects of nature. Whittall, in command of an armored-car squadron operating first in the desert sands of German Southwest and later in the equatorial sloughs of German East Africa, had a full experience of transport difficulties. His narrative shows explicitly some of the obstacles to be overcome in the opening up of Africa.

Dr. Walker's experience in the less mobile service of the field hospital was less extensive. He found leisure for observations on the natural history of his surroundings. He notes for instance the rare occurrences of the Swakop flood and a thunderstorm at the port and the curious phenomenon characterizing the coast waters during the Christmas season, when the gas-impregnated waters kill quantities of fish—each event, it may be noted, of a more than local interest, for parallel happenings take place on the analogous coast of South America. The pictures of the country seen by Dr. Walker are well worth noting; such is that of Windhuk—height encircled, its red roofs, white walls, and seven slender black towers (the noted wireless station) standing out of a landscape dappled with green thorn trees, bleached winter grass, and white sand.

The author of "Marching on Tanga" is a poet as well as a fighter. Beyond the cruelties of the struggle he feels the spell of Africa. In the dangers of the bush he sees the strange beauties around him: "And then, to my horror, the bush suddenly ended. We came without warning to one of those wondrously beautiful slades of waving grasses with which the thorn is scattered. All down the Pangani we had seen them waving their purple heads in the sun; but here the country was more parched and the waves were silver. A lovely sight, and very easy going; but to cross it would have meant certain death Our only chance lay in keeping to the bush around the slades of grass." And this is the bush: "Eternal thorn of mimosa and acacia, set with brushwood and spears of wild sisal below, tangled with fleshy cactus above—scattered here and there with withered candelabra trees lifting their dry arms above the thorn." There are also allusions to matters of deep human importance. The dwellers in the war-swept zones of Europe are not the only innocent sufferers. On the natives of Africa hardships have been entailed, loss of homes and resources and the stirring up of troublesome tribes. And the great movements entailed will not improbably further the spread of disease "in lands where assuredly there is enough already."

In the preparation of the article on the military campaigns against Germany's African colonies appearing in this number of the *Review* these three books were found exceedingly useful.

SUDAN AND UPPER GUINEA

CLARIDGE, W. W. *A history of the Gold Coast and Ashanti from the earliest times to the commencement of the twentieth century*. With an introduction by Hugh Clifford. Vol. I: xxxiii and 649 pp.; map. Vol. II: xv and 638 pp.; maps, bibliogr., index. John Murray, London, 1915. £1 15s. for 2 vols. 9½ x 6½.

This work is an important addition to African literature. It stands for much more than its title implies, for it gives a clear and adequate account of all the early explorations

along the African coasts; and all of them had their part in leading up to the Gold Coast enterprises. The Gold Coast for three centuries was the center of most European endeavor, good or bad, in Africa. These enterprises were the natural sequence of the life work of Prince Henry the Navigator, who sent many expeditions far down the west coast though they did not quite attain the Gold Coast. Prince Henry was preceded by other sailors also, and Dr. Claridge tells what they reported and critically examines their stories.

These early voyages also advanced the art of navigation. Prince Henry's caravels hugged the coasts, for it was not believed that any vessel could survive in the open sea, till one of his craft was blown out into the ocean and discovered the Madeira Islands, 360 miles from the African coast. Such work opened the way for Columbus' great venture. The slave trade originated along the west coast, and the author gives a connected account of the rise and progress of this infamous traffic. Thus we find in this work not only the detailed story of the Gold Coast colonies and Ashanti but also summaries of the relationship, for some centuries, between the whites and all these border lands of West Africa.

The story of the Gold Coast itself, especially during the hundred and sixty years of the Portuguese occupancy, has scarcely a redeeming feature. It was a time when greed, injustice, and brutality marked the policy of white adventurers, as is vividly set forth in this narrative. The larger part of the work is given to the rise, progress, and fall of the Ashanti nation. For two hundred years this remarkable people protected themselves against the aggression of all other Africans, but their empire crumbled completely at last, after seven wars with England between 1803 and 1900. Their military genius made them the most formidable native race in Africa; but whatever injustice may have been done them they are today more happy and prosperous than ever before, for their energies are given to the cultivation of their farms and cacao plantations and to the improvement of their towns.

Dr. Claridge's volumes show great diligence, a critical faculty, and the power of grouping facts in logical order and in proportions justified by their relative importance. It is a work that all students of Africa should read. CYRUS C. ADAMS.

REGELSPERGER, GUSTAVE. *Afrique Occidentale Française*. *Bull. Soc. de Géogr. Comm. de Paris*, Vol. 38, 1916, No. 7-9, pp. 454-455. [Abstracted in the July, 1917, *Review*, Vol. 4, p. 61. Deals with a journey by R. Chudeau in a portion of Upper Senegal opened up by the railroad connecting the upper Senegal River with the upper Niger.]

RENAUD, J. *Le port de la Côte d'Ivoire*. Maps. *La Géographie*, Vol. 31, 1916-17, No. 1, pp. 1-30. Paris.

VAN VOLLENHOVEN, J. *L'aide de l'Afrique Occidentale à la métropole*. *Renseign. Colon. (Suppl. à l'Afrique Française)*, 1917, No. 7-8, pp. 182-186.

VASCONCELLOS, E. J. DE C. E. *Archipelago de Cabo Verde: Estudo elementar de geographia phisica, economica, e politica*. 126 pp.; map, bibliogr. (Series: Colonias Portuguezas.) Centro Typographico Colonial, Lisbon, 1916. 8½ x 6.

— *West Africa, The new coal-field in*. Map, ill. *Bull. Imperial Inst.*, Vol. 14, 1916, No. 3, pp. 369-378. [Abstracted in the May, 1917, *Review*, Vol. 3, p. 403.]

X —. *Douala, port français*. Ills. *L'Afrique Française*, Vol. 27, 1917, No. 5-6, pp. 179-183. [Duala in the German colony of the Cameroons, conquered by the Allies in 1916.]

— *Africa, 1:125,000. Sheet North B-32/N-III (Kba)*. [Geogr. Section, General Staff, War Office, London.] 1st ed., rev. to 1914.

— *Africa, West coast of. Forcados River to Opobo River*. 1:250,000. *U. S. Hydrogr. Office Chart No. 2352*. Washington, D. C., July, 1916.

ASIA

SIBERIA

CZAPLICKA, M. A. *My Siberian year*. xii and 315 pp.; map, ill., glossary, index. James Pott & Co., New York, [1916]. \$3.00. 9 x 5½.

The author was one of a party who left England in the spring of 1914 under the auspices of Oxford University to travel in Siberia. Mr. H. U. Hall, to whom the book is dedicated, represented the University of Pennsylvania Museum on the expedition. (An article by Mr. Hall, based on the observations of the expedition, appears in this number of the *Review*.) The book contains much of interest in spite of a somewhat wandering method of presentation. There are many valuable illustrations taken from photographs,

but the map, purporting to give the route of the expedition, is of little use on account of its incompleteness. However, an ordinary atlas (or the map on p. 2 of this number) will allow the reader to follow Miss Czaplicka in her journey. The first summer was spent in the Big Low Tundra, the land of the Samoyedes, at the mouth of the Yenisei; the following winter among the Tungus near Turukhansk on the Yenisei just below the Arctic Circle; and the next summer in the Minusinsk district along the upper Yenisei south of Krasnoyarsk, a region not only picturesque and fertile but valuable both for its wealth of minerals and for the evidence of an ancient people that dwelt there in the days of the mammoth and the woolly rhinoceros. The author writes with sympathy and understanding of the people of the far north, with their childlike virtues and faults and their pitiful helplessness in the hands of the traders along the river, who, with a bottle of vodka, drive unmerciful bargains with the trappers and fishermen.

While the chief wealth of the northern peoples consists of reindeer, fish, mainly sturgeon and salmon, are of great value. In the Ob from sixteen to twenty thousand tons of fish are caught every year. On the Yenisei, where settlements are fewer and the means of transport less developed, the yield is between three and four thousand tons a year.

The working of primitive law on the tundra is shown in an account of the meeting of a native council composed of representatives of each clan. The council, which dates back to remote times, was originally a very democratic institution, but Russian influence in strengthening the power wielded by the presiding officer has made it less so. In the "Christian shamanist" is found the merging of ideas between primitive European and Asiatic minds, some superstitions of the Russian Christians being superimposed on the natives' belief in the medicine man, or shaman. The author suggests that the ideal apostle to these people would be a medical missionary to take the place of the shaman, and minister equally to body and soul. A weird and terrible tale is told of the working of the shaman's curse on an unfortunate who when drunk jibed at his pretensions.

The cunning policy of the late Russian Government in including in the same group of exiles both criminals and political offenders has had the desired effect of lessening the sympathy which the Siberian peasants formerly felt for the "politicals," a term which now by the indiscriminating has become a term of contempt.

In conclusion, the author discusses Siberia's possibilities as the Canada of the East, the home of a great self-governing people. Improvements in transportation are of great importance here, but the opening of the Kara Sea route, long closed by tariff regulations, and the extension of railways and canals are hopeful signs for the future.

R. H. JONES

CZAPLICKA, M. A. *On the track of the Tungus.* Ills. *Scottish Geogr. Mag.*, Vol. 33, 1917, No. 7, pp. 289-303.

KAMINER, A. *L'industrie de la Sibérie et la guerre.* Ills. *La Nature*, No. 2242, 1916, Sept. 16, pp. 189-192.

KRYLOV, P., AND E. STEINBERG. *Contribution à la flore du district Kansk de la province Jenisei.* *Bull. Acad. Imp. des Sei. [de Pétrograd]*, Ser. 6, 1917, No. 1, p. 1. [In Russian.]

LAUWICK, MARCEL. *Proposed new railways in Siberia: Opening up Lena and Ob districts.* Map. *London Times Russian Section*, No. 20, 1916, May 27, p. 12. [Abstracted in the December, 1916, *Review*, Vol. 2, p. 472.]

— *Siberia, Rapid growth of.* Map. *London Times Russian Section*, No. 23, 1916, Aug. 26, p. 6. [Abstracted in the October, 1916, *Review*, Vol. 2, p. 309.]

— *Siberian village life.* *London Times Russian Section*, No. 23, 1916, Aug. 26, pp. 6-7. [Abstracted in the October, 1916, *Review*, Vol. 2, p. 309.]

V—, J. *Le commerce extérieur russe par Vladivostok pendant la guerre.* *La Nature*, No. 2238, 1916, August 19, pp. 119-120.

SOLEY, JOHN C. *Coast line of Northeast Siberia, the New Siberian Islands and Kaiser Nikolas Land and Cesar-evich L. as discovered by the hydrographic expedition under Capt. Wilkizki, I. R. N., 1913.* 1:6,000,000. U. S. Hydrogr. Office, New Orleans Branch, 1916.

— *Vladivostok harbor and vicinity, including the Eastern Bosphorus or Hamelin Strait. (From Russian surveys between 1875 and 1896).* 1:25,000. U. S. Hydrogr. Office Chart No. 2071. Washington, D. C., July, 1916.

AUSTRALASIA AND OCEANIA

AUSTRALIA, NEW ZEALAND

TAYLOR, GRIFFITH. **The control of settlement by humidity and temperature (with special reference to Australia and the Empire): An introduction to comparative climatology.** 32 pp.; maps, diagrs. *Commonwealth Bur. of Meteorol. Bull.* No. 14. Melbourne, 1916.

The intimate relations which exist between climate and weather on the one hand, and the health, activity, and progress of mankind on the other, have long been an interesting subject for discussion. From the days of the early Greek philosophers and geographers, such as Parmenides and Strabo, through scores of later Latin writers, down to the recent investigations of Osborne, Vincent, Lancaster, Tyler, Huntington, and others, attention has been paid to such relations. It is natural that the later work has concerned itself more and more with *quantitative* expressions, in terms of temperature, humidity, wind movement, etc., in the effort to give more exact and more practical results. The literature on this matter is growing rapidly.

Dr. Taylor's memoir is one of the most noteworthy discussions which have yet appeared and, although already referred to in these pages (*Geogr. Rev.*, Nov., 1917, Vol. 4, pp. 401-403), merits a more extended notice. Essentially, it deals with the elements of relative humidity and temperature in their relation to the development of the white races and considers the difficulties in connection with the settlement of tropical lands, especially Northern Australia, by white men. The object in view is to determine broadly the *limits of comfortable settlement*.

Parts II and III of the memoir concern the mean annual range of temperature and the mean monthly relative humidity of Australia. Part IV deals with the "climograph" and its value in climatology. The climograph is "a graph in which the twelve monthly mean values of wet-bulb temperatures and relative humidity at a given place are plotted as a twelve-sided polygon, with wet-bulb ordinates and humidity abscissae" (see Fig. 1 in the *Review*, *loc. cit.*, p. 402). The climographs for twelve important centers of Anglo-Saxon settlement were averaged, and this average, or *type white climograph*, is used as a standard in all the other climographic charts. It ranges between the following limits: summer, wet-bulb, 62° F., humidity, 68.5 per cent; winter, wet-bulb, 37° F., humidity, 81 per cent. These results are, in general, similar to those reached by Huntington in his work. Specimens for typical climates illustrate the value of the climograph in any studies of climate in relation to settlement by white men. A tentative "scale of discomfort" is suggested. I, the *most comfortable*, has a mean monthly wet-bulb range of 45°-55° F. and approximately no uncomfortable days per month. VI, *continuously uncomfortable*, has an average monthly range of wet-bulb readings over 75° F. Such a scale suggests the late Professor Abbe's "curve of comfort" and Tyler's scale of "hyther." The last section of the memoir gives examples of climographs for the major natural regions suggested by the late Professor A. J. Herbertson. These diagrams show how neighboring localities differ *inter se*, how closely their climates resemble those of distant "homoclines", and how each differs from the *type white climograph*.

The author clearly emphasizes what he considers the most important feature of the memoir: it is the comparison which is here made between the various English colonies with reference to their availability for successful settlement by English people. The memoir was written in an attempt "to give a scientific basis to the climatic aspect of Empire-building and Empire-welding." The patriotic motive was obviously a very strong one.

Dr. Taylor's monograph is an extremely interesting and suggestive discussion of a very important subject. It merits careful study. A mere glance through its pages will not suffice for those who are working on the larger human relations of climate. The immediate practical application of the facts here set forth to the national problems of geographic rearrangements and of new settlements which will follow the war is obvious. The memoir distinctly deals with practical economic and political climatology.

R. DEC. WARD.

BASEDOW, HERBERT. **Physical geography and geology of the Western Rivers' District, Northern Territory of Australia.** Map, diagrs., ill., bibliogr. *Proc. Roy. Geogr. Soc. of Australasia, South Australian Branch: Session 1914-15*, Vol. 16, pp. 147-217. Adelaide, 1916. [Notes made by the author in the field, 1905. A geological map accompanies the article.]

BEST, ELSDON. **Maori and Maruiwi: Notes on the original inhabitants of New Zealand and their culture; on the question of how that culture affected the later-coming Maori; and on the existence in these isles of customs, arts, and artifacts**

not traceable to Polynesia. *Trans. and Proc. New Zealand Inst.*, Vol. 48, 1915, pp. 435-447. Wellington, 1916.

BEST, ELSDON. Maori storehouses and kindred structures, houses, platforms, racks, and pits used for storing food, etc. Preface by J. A. Thomson. viii and 107 pp.; ill., bibliogr., index. *Dominion Museum Bull. No. 5*. Wellington, 1916.

BEST, ELSDON. Maori voyagers and their vessels: How the Maori explored the Pacific Ocean and laid down the sea roads for all time. Glossary. *Trans. and Proc. New Zealand Inst.*, Vol. 48, 1915, pp. 447-463. Wellington, 1916. [The vessels of the voyagers; the discovery of New Zealand; the peopling of the Pacific.]

EDUCATIONAL GEOGRAPHY

GOODE, J. P. *Physical and Political Wall Map Series*. [18 maps, each of the 9 areas being represented by a physical and a political map:] (1-2) *North America*. 1:6,167,209 (*sic*). (3-4) *United States*. 1:3,015,936 (*sic*). (5-6) *South America*. 1:6,167,209 (*sic*). (7-8) *Europe*. 1:4,500,000. (9-10) *Africa*. 1:7,793,280 (*sic*). (11-12) *Eurasia*. 1:9,376,330 (*sic*). (13-14) *Australia and the Philippines*. 1:5,702,400 (*sic*). (15-16) *The World* (in Mercator's Projection). Equatorial scale, 1:26,294,400 (*sic*). (17-18) *The World in Hemispheres*. 1:26,000,000. With two insets, 1:75,000,000: (a) Natural Vegetation and Ocean Currents; (b) Mean Annual Rainfall and Prevailing Winds. Rand, McNally & Co., Chicago, 1913-17. Price, \$7.50 each, or more according to style of mounting.

As the first modern geographical wall maps of American manufacture, this series, now completed, deserves special attention. It represents a fundamental step in the right direction and fulfills a really important mission. In the physical set of the series American teachers for the first time have at their disposal adequate physical maps of the continents made for their own use. The fact that in planning this undertaking it was decided to make one of the sets physical is evidence of the author's recognition that the fundamental geographical map is the one showing relief.

Relief is shown by the usual tints varying, for the land, from green through yellow to brown, supplemented by hachuring, and, for the ocean, from white through light blue to dark blue. The land tints are separated by the contours of 0, 1,000, 2,000, 5,000, and 10,000 feet (100- and 500-foot contours are added on the United States map, the former not as a tint boundary; and the 5,000-foot is contour omitted from the world map) and the water tints by the isobaths of 0, 500, 5,000, 10,000, 15,000, and 20,000 feet (15,000-foot isobath omitted from the world map). This selection does not seem entirely fortunate. On land it omits the critical 600-foot contour, which broadly divides the lowlands from the highlands the world over—those lowlands which constitute one-third of the land surface of the globe and on which lives the greater part of human kind. In the highest elevations the subdivisions seem somewhat minute. Only one-tenth of the land surface lies at an altitude greater than 6,000 feet; and yet two tints are used for elevations above this level. Similarly it seems unnecessary to indicate by two tints the abyssal depths (below 16,000 or 18,000 feet), as they constitute a single broad division of submarine relief; one tint would have sufficed for this category (accounting, as it does, for only 1.4 per cent of the ocean floor) without impairing the effective representation of the characteristic troughs of the western Pacific. A scheme of vertical subdivision made up of more critical values might possibly read as follows: 6,000, 4,500, 3,000, 1,200, 600, 0, —600, —6,000, —12,000, and —18,000 feet. Through the introduction of the 600-foot contour the unnatural island-like appearance of certain highlands might have been avoided, which here seem to rise abruptly from the surrounding lowlands, an effect heightened by the sharp contrast between the green and the yellow tint used. This is notably the case with the Appalachians, as was pointed out in a previous review of the North American map in the series (*Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, pp. 715-717), a defect which the addition of the 500-foot contour on the United States map has noticeably remedied. The Brazilian Highlands suffer from the same treatment: this omission creates the impression that the lowlands of the Paraguay and of the Madeira are continuous, as it suppresses the meeting tongues of upland connecting the Bolivian plateau and the Matto Grosso highland.

Ocean depths are not always represented in the same way for identical regions. While the Liukiu, Philippine, and Sunda Troughs appear on the maps of Australasia and the world, they do not appear on the map of Eurasia, dated 1914, although complete information has been available since the publication in 1909 of the results of the *Planet* expedition.

In addition to hypsometry and bathymetry the maps of the physical set show warm

and cold ocean currents and January and July isotherms. The isotherm interval used, 10°C. , or 18°F. , is somewhat too large to bring out more than the most general climatic elements. A misconception, on the map of North America, of the temperature conditions over Greenland has been corrected on the map of the world.

The maps of the political set show, besides the political units and their subdivisions, cities (also on physical set), the main steamship lines (with distance in nautical miles), ocean cables, and railroads, distinction being made between the more important and the less important lines. The political units are very effectively brought out by marginal coloring. The cities are classified according to their size, the two largest classes on each map being made prominent by a red symbol and large lettering. On the map of Africa it may be the occasion of surprise to some to find the generally unknown towns of Abeokuta, Ibadan, and Ilorin ranked with Cape Town in size (100,000-200,000 class). And yet these three native towns are the expression of Africa's largest densely populated area, Nigeria. (However, a recent authority—Herbertson in "The Oxford Survey of the British Empire," Vol. 3, gazetteer—credits Abeokuta with only 60,000 and Ilorin with 70,000 inhabitants). The criterion used to distinguish the main trunk lines from the secondary railroads, as defined in the legend, does not seem fortunate. Except for the maps of Europe and Eurasia, main lines are considered to be those which connect cities of a certain rank, such as those of 200,000 inhabitants or over. For South America this leads to treating the Buenos Aires-Tucumán-La Quiaca line as secondary, except for the stretch Buenos Aires-Rosario. Even with the less arbitrary division on the map of Europe such important trunk lines as the Italian east-coast line to Brindisi and the Budapest-Iron Gates-Bukharest line are shown as secondary and the outlet of the latter to Constantza is not indicated at all.

Viewed broadly as to their general treatment both sets, the physical and the political, are very satisfactory. The requirements of a wall map, presentation of essentials only and effectiveness at a distance, have, on the whole, been well met. The altitude tints are very telling, and the coast line and the rivers are in general treated in the bold manner necessary for legibility at a distance. (Some rivers are shown in hair line: it would seem better to omit them altogether or, if considered essential, to weight them equally with the others.) The treatment of steamship routes is less in keeping with these principles: not only are they represented by lines so thin that, when single, they are not visible at a distance, but there is also a tendency to show individual lines rather than trade routes, so that, between Hongkong and Singapore, for instance, four or five thin parallel lines are used instead of the generalized line that sound pedagogy and cartography require. On the other hand, educational principles are observed in the arrangement of the maps as to the area covered. Eurasia is the title and the content of the sheet designed for Asia; and the inclusion of the whole Mediterranean, with its African shore, on the map of Europe and of the coast of Brazil on the map of Africa is evidence of the desire to bring out broader relationships.

In the matter of scale, however, the absurdity of citing the natural scale to the nearest unit (or ten or hundred or thousand, for that matter, on small-scale maps) has evidently not been realized since attention was called to it in the previous review mentioned. The underlying conception would almost seem to be that the question of scale is fortuitous and not in the control of the compiler. And yet the matter is very simple. A definite scale, suitable to the desired detail and the size of the map, is decided on beforehand, preferably one in round numbers, as 1:6,000,000 or 100 miles to the inch, and the map is then drawn with a view to reproduction on, or reduction to, that scale. If a miles-to-the-inch scale is used as the basis and it is desired to add the equivalent natural scale, this should be done exactly, in multiples of 63,360, a principle which is violated on all the maps except those of Australia and the United States (e. g. North America and South America, "1:6,167,209, or 97 miles = 1 in.'). If the natural scale is the basis, this should always be given rounded off to at least one per cent of the denominator (e. g. to the nearest ten thousand in millionth scales) as any greater nicety is rendered futile by the limitations of printing and the liability of paper to shrinkage.

But these imperfections should not obscure the larger value of the series. To accustom our teachers to the use of the physical map is no unimportant mission. That custom once firmly established, we can then proceed to the wider field of mapping, as Unstead and Taylor have done in England, the gamut of geographical phenomena for each region or—a specifically American undertaking—of representing on a larger scale the individual sections of our country.

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THE ESKIMOS OF NORTHERN ALASKA: A STUDY IN THE EFFECT OF CIVILIZATION

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The changes produced in the life and habits of the Eskimos of Northern Alaska during the last thirty-five years afford an interesting example of the effect European civilization may have upon an uncivilized and unprogressive people. By European I mean also American, since it was the United States and Canada, and practically they alone, which influenced and are influencing this region. That these Eskimos were incapable of developing internally to any marked degree is fairly evident from the fact that during all the centuries that have elapsed since their separation from the other branches of their race no fundamental change has taken place in either their social or their mental life. In fact, the environmental conditions to which they were subjected were unfavorable to any great development. Year by year the seasons returned unchangingly, each with its different pursuit, but all alike periods of strenuous quest for food. Spring brought the birds, the fish, and the whales; summer the trading voyages to east and south, followed by the caribou hunting and the fishing of late summer and autumn; while winter completed the circuit with its sealing through the ice. Whaling, fishing, and caribou hunting necessarily precluded much contact with neighboring peoples, while the trading in summer and the visits for dancing and festival in winter were all too brief to produce any radical change in their manner of life, even if their neighbors had been materially different. But the people who lived along the coast to the south and east were the same as themselves, while they rarely penetrated far enough into the interior in those days to come into contact with the Indians, with whom, moreover, they were usually on hostile terms. The use of fish nets and pottery, the custom of wearing labrets, and that of smoking are almost all that we can ascribe to outside influence. The great world beyond was too remote ever to reach or affect them, and their own

life involved too arduous a struggle for existence to allow them that leisure which alone enables a people to develop.

PRESENT DEPENDENCE UPON OUTSIDE CIVILIZATION

With the advent of Europeans all this changed. The explorers of the middle of the nineteenth century remained for too brief a time and held themselves too much aloof to exert more than a temporary influence. The replacement of stone and copper utensils by iron was the main change this contact produced. The advent of the whalers about 1880 turned the scale. They mingled freely with the natives; formed temporary unions with their women; prosecuted an extensive trade with them for whalebone, caribou

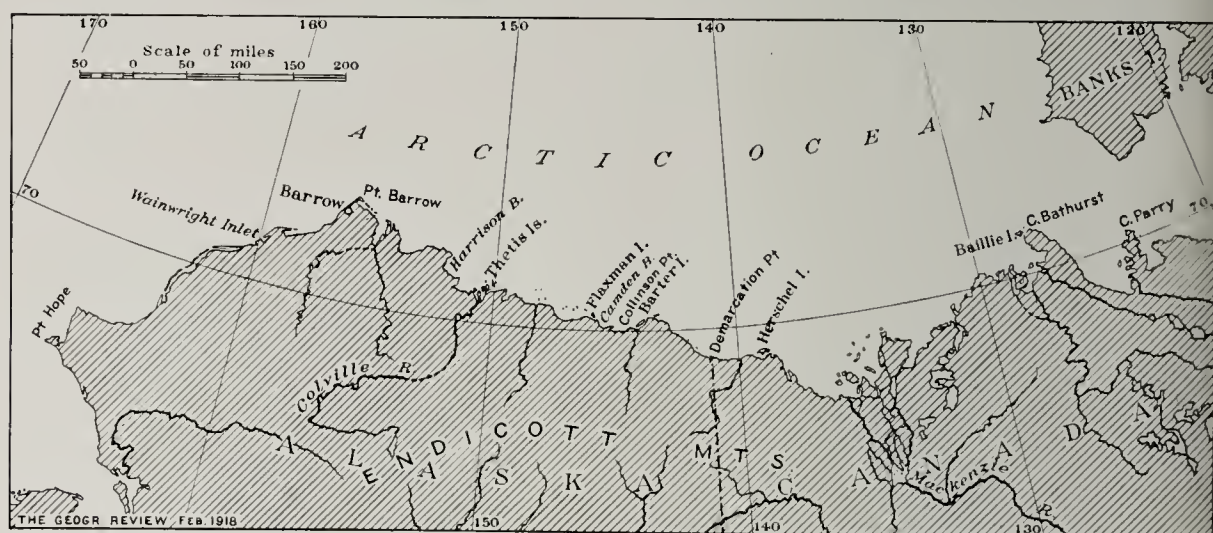


FIG. 1—Sketch map showing the habitat of the Eskimos of Northern Alaska. Scale, 1:15,500,000.

meat, and skins; and used their services on and around the ships. Some of the seamen even deserted their ships and adopted the life and habits of the Eskimos. Firearms were introduced, and European food, notably flour, sugar, and tea, became first a luxury, then a necessity. The years from 1880 to 1890 saw the zenith of the whaling industry, when whalebone brought its highest price in European and American markets. With its decline a demand for polar bear and fox skins arose, and the attention of the natives was directed to the more permanent and profitable pursuit of trapping. This pursuit has endured to the present day and seems likely to continue indefinitely.

Firearms quickly produced a revolution in the economic situation. The caribou, never very numerous west of the Colville River, were exterminated or driven east. But few now find shelter in the winding valleys and lakes of the Colville basin and in the Endicott Mountains which separate it from the basin of the Mackenzie. Mountain sheep have always had a rather limited range and are now becoming rare even in their principal habitat, the Endicotts. Consequently, the fur necessary for winter clothing had to be brought in from outside, and the Eskimos west of the Colville ceased to be

self-supporting. At the same time a great impetus was given to the hunting of ducks, geese, and loons, and to the shooting of seals, as they basked on top of the ice in the warm days of spring or protruded their heads out of the water in summer and autumn. Winter sealing, with all its attendant exposure and hardships, gradually fell into decay, and the season was devoted to trapping foxes. European food, purchased in summer with fox skins, a few birds, and frozen fish stored away in the autumn have now practically superseded seal meat for the winter diet; while the whales killed in the spring supply not only much of the blubber but also the "black skin," or *maktak*, which has always been regarded as a delicacy. The blubber lamp has given place to the lantern and kerosene for light and to the iron stove and "Primus" lamp for cooking, though at Barrow, where the wood supply has been exhausted, whale blubber is burnt for fuel in iron stoves. At least half of the food consumed by the Eskimos of Northern Alaska now comes from European sources.

The winter house, on the other hand, though slightly modified by the introduction of iron stoves, has changed but little from its original form. From the first thaw in May, however, till the freeze-up again in September it is uninhabitable, for the melting of the winter coat of snow floods the interior with water. Formerly the Eskimos moved in spring into tents of caribou skin, which they carried in their umiaks along the coast and up the rivers, and packed on their backs overland during the caribou hunting of summer. Now they everywhere use tents of cloth, which are both cheaper to make or buy and lighter to carry. Some, indeed, at the beginning of winter surround their tents with snow walls instead of building or reoccupying their huts of wood. At Barrow a few cottages have been built on a European model, with board floors raised slightly above the level of the ground. They too are lined with snow walls in winter, which are removed at the first sign of warm weather in spring, and are thus habitable the whole year round.

REINDEER

Life's three great necessities, therefore, food, shelter, and clothing, the Eskimo is no longer able to provide for himself. Remove the supply from without and he will perish within a few years. The United States government has indeed attempted to restore their independence by introducing herds of Lapland reindeer at Barrow, Point Hope, and other places farther south; but the project can hardly be considered to have passed much beyond the experimental stage, at least in the north. The Eskimo there has always been a hunter and finds it very difficult to accommodate himself to the pastoral life of the Lapp, however profitable it may be. Whether the breeding and tending of the reindeer will ever become popular and universal among them still remains doubtful, though amongst the natives farther south it has already become one of the most important economic factors in



their life. But reindeer have not been established east of Barrow, and perhaps never will be. Nothing in that region indicates that the life of trapping and hunting will ever be changed.

CHANGES IN MATERIAL CULTURE

It follows as a natural result that their material culture in all its details has undergone great change. The old weapons of the chase are fast disappearing. Stone immediately gave place to iron, the bow and arrow soon vanished, and the harpoons and spears used for sealing and whaling are fast following in their wake. The three-pronged bird spear with its thrower (the musk-rat spear of the Mackenzie, the fish-spear of the Copper Eskimos) and the bird bolas are now very rare. Even kayaks are far less common than formerly, and the skin umiak is being supplanted by the whaleboat. The sled introduced by the whites replaced at once the old type with mud runners, and the harness, though still widely used in its old form, is generally made of leather or canvas instead of deerskin, while the trace is invariably of rope; as for the dogs they are now driven single file or in pairs, not abreast. European tools, axes, saws, knives, files, scissors, etc., are found in every household. Of their old implements only five are in everyday use, the snow shovel, the bow drill, the curved whittling knife, the woman's knife, and the skin scrapers, all of which, save perhaps the bow drill, are more adapted to the purposes to which they are applied than any implement which we can supply. It is interesting to note that while the implement used for stretching and softening skins is generally an iron ferrule set on a short wooden handle, the actual scraper, which is set on a similar handle, is still commonly made of flint. The scraper, its flaker of copper, and the snow shovel—these alone have preserved the original type unchanged. Many natives possess sewing machines, for calico overclothes are held to be as necessary as fur underclothes. Woolen hose, woolen shirts and vests, even felt and leather boots are daily growing in use. The old-fashioned frock coat has been superseded by a plainly cut style which shows no variation from Nome to the Mackenzie. Labrets are worn by but one or two old men, and the curious willow-stem pipes, modeled perhaps on an Asiatic pattern, cannot withstand the invasion of the briar and the cherry. Very little in the outward culture now differentiates the Eskimo from the white.

CHANGES IN POPULATION

Equally great has been the change in the density and distribution of the population. The coast from Barrow to Demarcation Point was once the home of a thriving people, as is attested by the numerous ruins of settlements on the Thetis Islands, at Collinson Point, Barter Island, and elsewhere. But almost all these Eskimos, for some reason which is not at present known, had disappeared before the arrival of the whites. Dease and

Simpson, when they voyaged along the coast in 1837, and Collinson, when he wintered in Camden Bay in 1852, saw but few remnants of them. Barrow and Point Barrow alone seem at first sight to have kept up to their ancient level; but they too have declined, for, as Stefansson has already pointed out, but few of the existing inhabitants are descendants of the former population; the great majority are immigrants from elsewhere, from the interior and from the coast settlements to the south. Diseases, especially measles, tuberculosis, and venereal diseases, followed in the train of the whalers; fostered by a lax morality and by a total ignorance of the laws of hygiene, they swept through the helpless population like a devastating plague. Today their ravages are less apparent—the first invasion of a new disease is always the most fatal—but they have left their traces everywhere. The last two diseases are still common, and the descendants of the old coast population, who were naturally the most affected, seem to have lost some of their virility; at all events it is noticeable that almost all the whaleboats at Barrow and Point Barrow, together with the scows at the mouth of the Mackenzie, are owned by natives from inland. They migrated from their homes, the Eskimos of the Colville and westward going for the most part to Barrow and Point Barrow, those eastward of that river to the Mackenzie. In the winter of 1913-14 only one family was said to be living in the Colville basin, and not more than three or four pass the summer there. Yet thirty years ago a considerable population fished up and down its rivers and speared and netted caribou on its hills and lakes. Natives from Barrow and Point Barrow spread eastward in winter as far as Harrison Bay for the purpose of trapping foxes; in spring and summer this part of the coast is deserted. Between that point and Flaxman Island there are no inhabitants. In 1913 and 1914 six families resided, winter and summer, between Flaxman Island and the boundary, but all of these were newcomers—two from the Colville, one from Point Hope, and one from Port Clarence. Some dozen families belonging to the old inland people still winter on the south slopes of the Endicott Mountains within the tree line, trapping and caribou hunting. In spring, during the bird and sealing season, they come down to the coast and trade with their fellow-countrymen and with an occasional white man; in autumn they retire over the mountains again. This is all that remains of a once dense population, dense, that is, for a people that gained its living by the chase.

SOCIAL AND FAMILY LIFE

Generally, but not always, the social organization of a hunting people is very simple, and the Eskimos were no exception. They lived in groups of families which clustered together in winter at the sealing and whaling grounds and scattered inland in summer for the caribou hunting. The families were connected by ties of kinship and relationship, and the communion and intercourse between them was consequently closer than in the

more heterogeneous villages of the civilized world. There was no division into rich and poor, for the products of the chase were shared by all. Some were naturally better hunters, more skilled in magic, or possessed more force of character, and so enjoyed greater influence than their fellows; but in theory all were equal. Characteristic of the winter life was the dance house, where the people diverted themselves and entertained their visitors. At odd times it formed a sort of clubhouse and common workshop for the men and a playroom for the children. Barrow annually exchanged visits for trade and dancing with Wainwright Inlet. The migratory life of summer naturally excluded the dance house. At that season they wandered over the land in small bands, each comprising three or four families who combined for caribou drives very similar to those which still take place among the Copper Eskimos to the east. Organized war was unknown; whatever hostility took place was sporadic and unpremeditated. Within the community the great guardian of the social rules and customs was public opinion. Murder provoked the blood feud, and a flagrant wrongdoer might be suddenly attacked and killed by his neighbors with the approval of the community at large.

The home life seems to have been peaceable and well-conducted. The aged were treated with respect, the young with indulgence. It is doubtful whether these Eskimos ever regularly deserted the old and infirm when their strength gave way; present-day natives deny the charge. Nor has infanticide been proved against them, though the practice of isolating mother and babe for months, often provided with the poorest shelter against the winter cold, must have caused great mortality. Adoption was frequent, the adopted child receiving the status and treatment of the real. Chastisement of children was rare, though it did occur, and harsh conduct brought condemnation and ill will from kinsmen and neighbors. The Eskimo carried into his home the patience and endurance instilled into him by his whole manner of life, by the weary watching over the seal hole in winter, the tedious fishing of spring, and the waiting behind cover during the caribou drives of summer.

The change in the economic environment has naturally reacted upon all this. In winter the families scatter by twos and threes for trapping. Frequently two families, generally but not necessarily connected by kinship, occupy a single hut. Sometimes they divide it by a partition wall, leaving a blank space at one end of it to serve as a passage between the two rooms. The dance house has vanished; such dances as occur at Barrow and Point Barrow, the only places where there are any great assemblages of people, are held in ordinary private houses. In spring the families reassemble for sealing and whaling, but they are more or less unsettled throughout the summer and autumn. The influx of natives from other places has relaxed the old intimate relations that prevailed amongst them, though open house is still kept everywhere and friends and strangers alike are hospitably enter-



FIG. 3.



FIG. 4.

FIG. 3—Man in kayak drawing fish out of a net. Canadian Arctic Expedition's schooners *Alaska* and *North Star* in the offing. Shingle Point, Mackenzie River delta, August, 1914.

FIG. 4—Aiyakak digging in the ruin of an Eskimo house. Western sandspit of Barter Island, July, 1914.



FIG. 5.



FIG. 6.

FIG. 5—Inland Eskimos reaching Collinson Point in May, 1914 after spending the winter trapping south of the Endicott Mountains, Northern Alaska.

FIG. 6—Fox skins drying. Humphrey Point, Northern Alaska, May, 1914.

tained. Trade is producing a growing differentiation in the matter of wealth, but there is no distinction of class and no real poverty, for the needy are supported by their more prosperous neighbors. The administration of justice has passed into the hands of the United States government, and in consequence the blood feud has disappeared. So, too, have other old customs, sorcery and magic of every kind (at least on the surface), and the isolation of women in childbirth. Sexual morality has greatly improved, partly from a growing knowledge of the evils to which loose living gave rise, partly as a result of missionary teaching. Much progress must still be made, however, before the standard of civilization is attained.

READJUSTMENT OF THE SOCIAL SYSTEM

Stefansson recommended, on the ground of humanity, that the Copper Eskimos should be allowed to live their life undisturbed by any intrusion from outside. This is no longer possible, since the world has learned of their existence, apart from the fact that they themselves are now beginning to make annual visits to Great Bear Lake, where they meet with both Indians and whites. Nor does it seem justified by what has happened in Northern Alaska.

Speaking generally, when a savage or uncivilized race is first brought into contact with civilization, two results usually occur. First the old social system breaks down, carrying with it the morality that it supported. This opens the road to self-indulgence and excess of every kind, followed by disease and misery, which, partly directly, partly indirectly, by undermining the virility of the race, cause its decline and sometimes its extinction. This is what occurred, for example, in Tahiti, and amongst some of the American Indians. Sometimes, under counteracting influences, the people recover, as in Samoa, and such recovery seems to be going on in Northern Alaska. There the very simplicity of the social organization and its adaptability to new conditions prevented its destruction; it altered without entirely breaking down. It still lends its support to the respect with which property and persons are regarded and binds the people together in harmony and good-will. Injustice and theft, spite and malice occur the world over but are not more common in Northern Alaska than elsewhere; probably they are less common, since the hardships and vicissitudes of Arctic life render it necessary for every man to be ready and willing at all times to help his neighbor; another day he may himself stand in need of assistance. The one virtue which the Eskimo of Northern Alaska lacks is cleanliness. Yet even in this he has made a great stride forward, as may be realized when one compares him with the Copper Eskimos. It must not be forgotten that for eight months in the year every drop of water that he uses, whether for drinking, cooking, or washing, he obtains only by melting snow or ice within the house, in a small pot upon a tiny, often homemade, stove; and further that the fur clothing he wears, the only kind of clothing that is

adapted to the rigorous climate, must be kept dry at any cost and so cannot be maintained spotlessly clean like the woolen and cotton garments of civilization. He may be forgiven, then, if he fails to attain our standard of personal cleanliness. Undoubtedly he will continue to improve in this respect as time goes on; at present it is ignorance rather than carelessness that keeps him back. We cannot attribute to bad hygiene alone the spread of disease and consequent heavy mortality of the past. Even under the best conditions a new disease will travel far and wide. Moreover, there are strong grounds for believing that these Eskimos were declining in number



FIG. 7—Tents of two Eskimo families (Aiyakak's and Teriglu's) near Barter Island, May, 1914.

even before the whites appeared; it is difficult otherwise to account for the extent and number of the ruined settlements that dot the coast line. The same slow process of decline seems to be going on today among the Copper Eskimos, though the cause remains obscure.

MISSIONARY INFLUENCE

Missionary teaching, however imperfectly understood, and however misinterpreted, has been on the whole beneficial to the Eskimos. A native no more than the average white man can reason out a set of moral rules to guide his conduct. He depends on custom to tell him what to do and what not to do, and custom unfortunately prescribes or allows many undesirable practices. I once remonstrated with some Copper Eskimos about the wanton killing of caribou when not absolutely required for food or clothing. They merely replied, "Oh, but that is our custom," and considered the matter ended there. So, too, in Northern Alaska, custom prescribed all kinds of magical ceremonies in connection with hunting, sometimes accompanied by the grossest immorality. When the old customs were thrown overboard with the coming of the whites, missionary teaching stepped in and with its peremptory commands of "thou shalt" and "thou shalt not" upheld the better elements in their moral code, while unconditionally condemning the bad. The Eskimos grasped immediately at the externals of the religion offered him, the praying and the singing that so much resembled his old incanta-

tions, and the resting on Sunday. It would be hard to find a family in the whole length and breadth of Northern Alaska that is altogether indifferent to these things. Yet it is wrong to affirm therefore that the total result of missionary teaching has been simply to introduce new ceremonies, new incantations, and new taboos in place of the old. Such a view overlooks the strong influence exerted toward a higher morality and a more intellectual life. Man's thoughts and actions are not revolutionized in a day; the wise teacher looks to the future for his results, to the generations that come after him. So if the Christianity of the Eskimo today is very crude and full of superstition, it is nevertheless free from many of the injurious practices of his old religion and contains in itself the germs of a higher development.

TRAPPING AS AN ECONOMIC READJUSTMENT

The second result of contact with civilization is the change it produces in economic conditions. The native, unable to adapt himself to the altered circumstances and take up a new mode of life, loses all his energy and pines away in idleness and melancholy. To this more than to any other cause must be attributed the total extinction of so many uncivilized peoples during the last four centuries. Protective legislation and the fostering care of a paternal government can delay but not arrest its action. There is but one remedy, to find some new field of enterprise that will be congenial to the natives and absorb all their energies. Such to the Eskimos is trapping. It requires almost the same exertions out of doors in the winter twilight as did sealing through the ice in former days, while their old love of the chase still finds its outlet in the caribou and mountain-sheep hunting in the Colville valley and the Endicott Mountains, in the whaling round Barrow, and in the shooting of birds and seals all along the coast. Conditions have changed, but not so much as to make the Eskimos lose their grasp of things, and the new mode of life, if it involves less hardship than the old, is not so easy as to sap their energies and destroy their virility.

EDUCATION

Education is slowly spreading among the younger generation. English is taught in the school at Barrow and by the missionaries in the Mackenzie Delta, while the natives pick up a little from the traders. Only two or three indeed could write even the shortest letter in English; but notes in their own language, in the simple script of the missionaries, are freely current all along the coast. The Eskimo may have been a savage in many of his customs, but in intelligence he ranks far above the average. The Northern Alaskan natives did not adorn their implements with representations of the chase to the same extent as their kinsmen in Greenland, yet they possess no mean artistic skill. Young and old alike can make presentable drawings of men and animals, of hunting scenes, and of domestic life. A Colville River Eskimo who had never handled a pencil before made a very tolerable sketch of the Colville River and its tributaries. They have always been skilful in

the use of tools and in consequence make admirable craftsmen. Many take their watches to pieces and put them together again. Talents such as these are likely to be especially useful in a people on the very outskirts of civilization.

FUTURE PROSPECTS

The exact number of the half-caste population is uncertain. Undoubtedly it is very small as yet, but it will probably increase as time goes on, for



FIG. 8—The Klengenberg family, Baillie Island. The father was of Danish extraction, the mother an Eskimo woman from Cape Prince of Wales.

the Eskimos have no objection to intermarriage. The mixed race must of necessity follow the same manner of life as the natives. At the same time it should prove a strong factor in the progress and development of the country from the greater interest it is likely to have in the outside world. Even now some of the Eskimos are beginning to trade directly with the United States, sending their furs through the post office at Barrow. There is every reason, then, to believe that these Northern Alaskan natives will escape the fate of so many uncivilized peoples of the present day: they will survive, like their brethren in Greenland, as a factor of no large importance, yet not altogether unproductive, in the world's life. Civilization, if it brought ruin and destruction at its first invasion, remains to build, and the new edifice promises to be fairer and worthier than the old.

THE ISOLATION OF THE LOWER ST. LAWRENCE VALLEY*

By RODERICK PEATTIE

In the Lower St. Lawrence Valley is established a civilization unique in its lack of progressiveness and picturesque in its proud adherence to the ancient customs of ancestral founders. The wooded mountains shadowing the valley, the steep cliffs which rise, at places, straight up from the river bank, the comparative inaccessibility of stretches of lowland available for agriculture, the scarcity of good harbors from the Gulf to Quebec—all are natural factors which have combined to isolate the inhabitants from the rest of the world and even to a surprising degree from one another.

Here, on strips of land or in little towns by the shore, the French Canadian engages in primitive but thrifty husbandry. Modern education has penetrated the region but slightly. The people have preserved the traditions brought overseas from France and have developed a provincialism which has recognized throughout the years no law of conqueror and no control save that of the Catholic Church and which is at present serenely withstanding the censure of more belligerent peoples.

The Physical Conditions of Isolation

The Lower St. Lawrence Valley may be thought of as extending from the Isle d'Orléans, just below Quebec, to the relative restriction of the river between Cap des Monts on the north shore and Cap Chat on the south shore (map, Fig. 1). In the three hundred miles of its length the estuary widens from two to forty miles, which is a prominent factor in giving each shore certain physical and economic distinctions.

THE NORTH SHORE

The north shore is characterized by a bold escarpment 1,500 to 2,000 feet in height, the crest of which is the southern boundary of the great Laurentian upland. Set back perhaps a mile from the edge of the escarpment are low, rounded mountains, the Laurentides, rising 500 to 1,500 feet above the upland. The upland itself dips gently northward; its undulating, tree-covered surface extends mile upon mile with amazing lack of striking forms of relief.

There are few settlements upon the upland. For the most part, forested wilderness comes unbroken to the escarpment, and in places the trees crowd down the steep slope to the water's very edge. Some of the community

* This paper is the result of a library investigation, followed by studies in the field during the summer of 1916, carried out by the writer under the direction of the Department of Geography at Harvard University. These studies included a 900-mile trip along both shores of the estuary—300 miles on foot and the rest by train, wagon, steamer, row boat, and butcher cart.

groups so infrequently scattered over this country of rugged solitude lie at the mouths of tributary stream valleys, others on terraces that lie at the base of the cliff. Wedge-shaped rift valleys penetrating the highlands offer sites for farming communities, and even the margin of the highland boasts settlements. Generally the upland has too meager a soil for agriculture, but where the Laurentides have stood as a protection against more severe glacial erosion the soil is deep. The coastal terraces, particularly the lowest, are of primary importance as settlement sites. These terraces are mantled with rich marine soils.

THE SOUTH SHORE

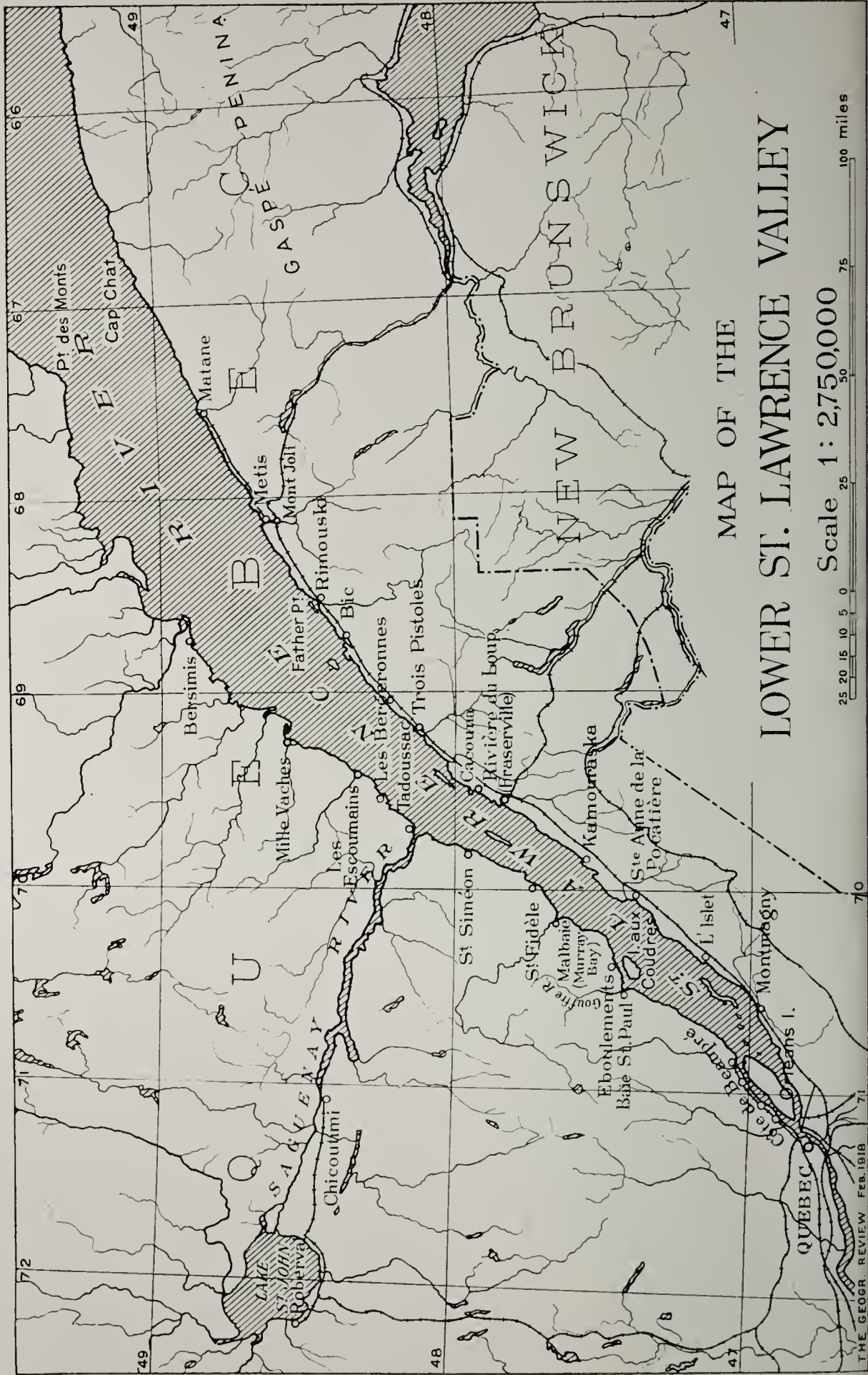
Bounding the south shore is another highland. From elevations of 1,000 feet opposite Quebec, it grows into mountains 3,000 feet in height as it nears the Gaspé Peninsula. Like that on the north, this upland is a rolling, infertile woodland plain, farmed only at the edge for the most part; but instead of terminating in a cliff, it descends gradually to the lowland. Although it lies 30 miles inland at the western end of the valley it approaches the river 100 miles down stream. From that point it follows the shore more closely, in most places grading down to the level of the water by a series of broad terraces.

These terraces are fertile, though for various reasons not always well drained. The lowest, as is the case on the north shore, is of recent emerged estuarine silt. The soil of the lower terraces, and in the western end of the valley of all the terraces, is marine and very productive.

CLIMATE

The climate is of an extreme continental character on a leeward coast in a belt of prevailing westerlies. Herbertson has called it the Laurentian type and compares it with the similar climate of the Amur district. There are within the region two slightly different types. The seaward portion has an appreciable marine influence, to which is added the effect of an increase in latitude by the northeast trend of the river. Generally speaking the winter is long and cold and the summer is short and warm. The precipitation is not heavy.¹ The result is a natural vegetation of the northern conifer type, principally of spruce, fir, and pine. Hardwoods are also abundant. The snow lies on the ground until May, but once it is melted the spring blooms suddenly. The growing season has a maximum of 150 days and is usually considerably less, but the summer day is long and the rainfall not too heavy, so that grains will mature. Maize is not grown, and the frost-free period is too short for the larger fruits in the greater part of the area. The heavy snow, averaging 120 inches in depth, supplies a roadbed

¹ The mean annual temperature range is 60° F. in the southern division, but in the north this is reduced by 10°. The mean monthly temperatures of Quebec are: January, 9.4° F.; July, 65.5° F.; for Anticosti Island (Southwest Point), January, 12° F.; August, 57° F. Precipitation is 40 inches at Quebec and 35 at Father Point, about 70 per cent of this being in rain.



for logging in winter and water for the spring "runs." For five months of the year Quebec is a closed port, and the river is dangerous for at least one month more.

Economic Responses

Such are the physical conditions of the valley. A few of the economic responses which result from these will now be described. The region has terraces and lowlands in which life never has been meager. Wood products and, recently, farm products have furnished the foundation for a healthy commerce. But the primitive economy of the hinterlands on each flank, the imperfect communication, and the lack of doorways by which one may enter the territory have been formidable barriers to cultural exchange.

ECONOMIC CONDITIONS OF THE NORTH SHORE

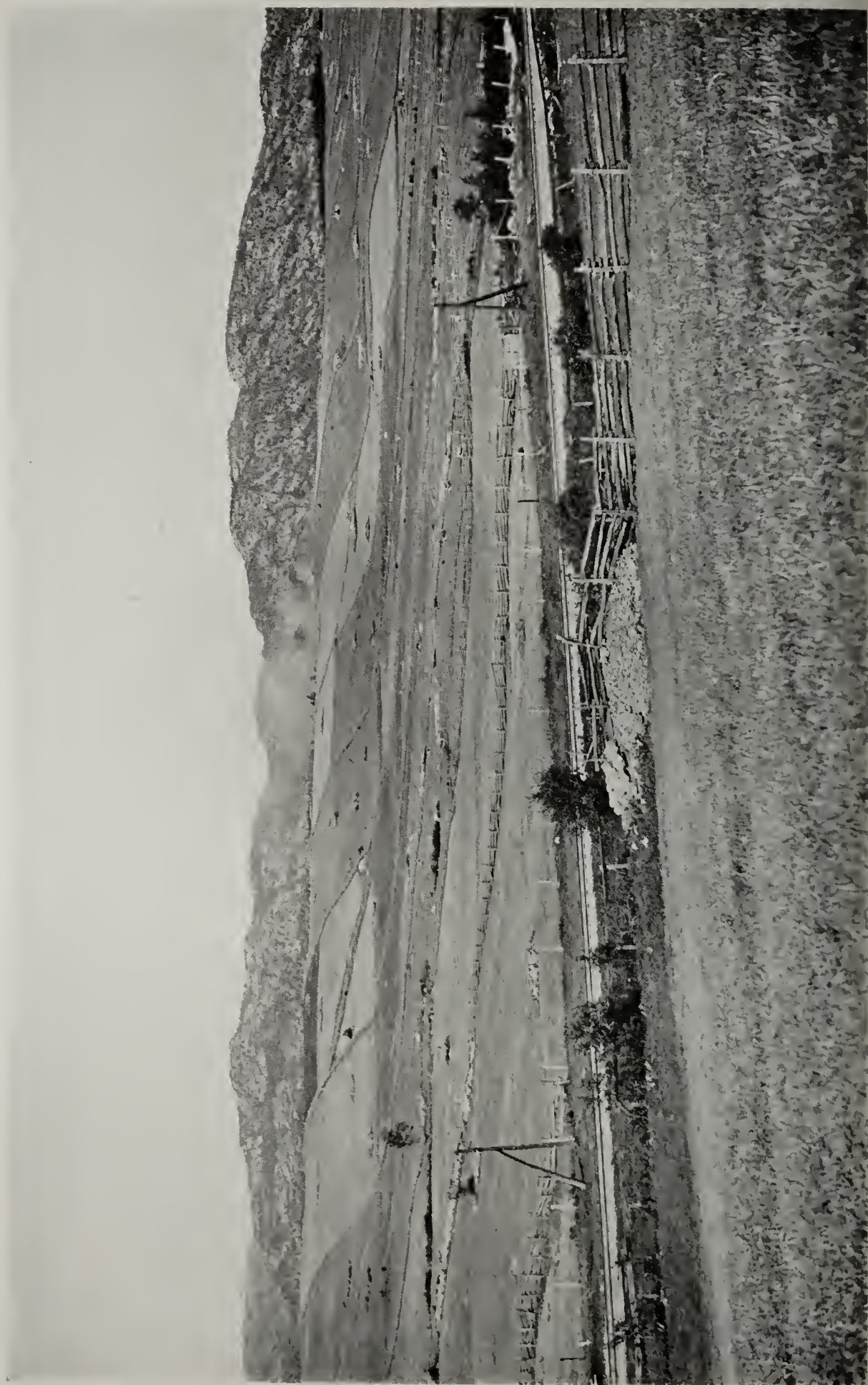
The farm products of the north shore are grains, hay, vegetables, and tobacco for home consumption. The one "money crop" is cheese—a recent development. This statement does not apply to the Côte de Beaupré, where milk, butter, and vegetables are furnished to the Quebec market. No village or hamlet is without the log-products industry. There are extensive lumber, pulp-wood, and pulp mills on the larger streams, and no settlement is too small to support some industry dependent upon the forest and the water power. It may but be a small water-run mill for crude lumber or a commerce in cord wood.

The water power is furnished by every stream in greater or less degree as it tumbles down from the upland. The Côte de Beaupré alone is served by a railroad. Beyond, the uplands come to the river's edge and present a cliff 1,500 feet high for 30 miles. At the base of this cliff a railroad bed has been blasted as far as Malbaie and will be continued to the Saguenay. The other communities are now reached for the most part by boat. As far as the Saguenay the boat service from Quebec is regular through the summer months.

There is no farming and but one large stream between St. Siméon and Les Bergeronnes; hence there are no settlements except Tadoussac, which is a resort and the point of transfer for the Saguenay River. From Les Bergeronnes to Mille Vaches there are streams which bring down timber and furnish power for its reduction. The climate and the peaty variety of much of the soil make farming a precarious pursuit. Beyond Mille Vaches there are no roads and scarcely a farm. In the remaining 100 miles there are half a dozen settlements deserving the name of town, and these are supported largely by fishing.

ECONOMIC CONDITIONS OF THE SOUTH SHORE

The south shore has much rich lowland, and, moreover, it is continuous, so that there is good rail communication. It is primarily a farming district, though in the aggregate the industries are not unimportant. The climate is



somewhat milder than on the north shore, and, owing to the favorable topography and the good land communication, the farmer may consider himself possessed of advantages over his fellows upon the other side of the river. The Intercolonial Railway parallels the coast from Quebec to Mont Joli, and a small line continues to Matane. Butter, cheese, and live stock are sold according as the distance from Quebec becomes greater. Vegetables, particularly potatoes, and eelgrass (*Zostera marina*), for upholstering automobile seats, are other "money getters." The region has a fine active commerce through Quebec, but cultural contact in other directions is practically nil.

The industry upon the south shore is not extensive enough to do more than mitigate the isolation. The farming centers are small towns from ten to twenty miles apart. None of these are large even when they contain factories. The industry is usually some form of woodworking such as the production of lumber, pulp wood, furniture, or wagons. The larger mills are located at Ste. Anne de la Pocatière, St. Pâcome, Rivière du Loup, Bic, Tobin, Rimouski, Priceville, and Matane. Generally speaking, the greater the distance from Quebec, the less finished is the article produced.

POOR WATER COMMUNICATION

Strangely enough, though the Lower St. Lawrence is one of the great commercial estuaries of the world, the region has, as a whole, poor or imperfect water communication. The reasons are these: First, there is the significant climatic fact, already mentioned, that Quebec is a closed port five months in the year and a dangerous one for at least another month. Second, the region lacks good harbors, especially upon the south shore. The coast is much indented, but the present physiographic condition of the estuary is one of emergence of a confined delta, so that the approach to the shore is always shallow. Father Point, near Rimouski, and Rivière du Loup form partial exceptions to this condition, but much of the huge output of lumber from Matane is taken out to ships by means of lighters, and Rimouski sends its lumber out over a harbor that at low tide is dry for two miles from the shore. The north shore with the exception of Tadoussac has no natural harbors for large craft. The boats land at piers which are not always near the town and are frequently useless at low tide. Baie St. Paul and Murray Bay are huge indentations guarded by rugged capes, but the recent uplift and the constant filling by streams has created tidal flats of from one to three miles over which only the smaller type of schooner can float at high tide (Fig. 9). The distance from the farming centers to the docks, and the irregularity and inconvenience of the boat service, are discouraging features of communication. Beyond the Côte de Beanpré the bulk of the freight can be moved only in summer, for in winter the only communication is by small ferries that run across to the south shore. Because of these difficulties the north shore still preserves a large measure of independence.

RECENT MODIFICATION OF ISOLATION

Ten years ago isolation was almost complete. Since then there have arisen ameliorating factors. The simultaneous development of transportation facilities and of the cheese industry brought buying power to regions which a few years before were compelled to provide for themselves everything in the way of food and clothing and all building materials save hardware. Even today the food is nearly all of home production; linens and woollens are spun in the cottages; tools as likely as not are homemade; and ideals are surprisingly local. This independence never existed in the region beyond Mille Vaches. Fishing communities have always been commercial, but distance, combined with seasonal isolation, can affect remote settlement to a degree almost incredible to those accustomed to the social and commercial exchange of more populous districts and a more amenable climate. There is much undeveloped water power in this region, but under present conditions it is not profitable, apparently, to go so far from the centers of population as western Quebec and the Maritime Provinces for power, particularly as the region is limited in its resources.

Another factor may be mentioned here. It is the culture brought in by the numerous visitors to the fashionable resorts of Murray Bay and Tadoussac, and the more modest ones of M  tis, Kamouraska, and Cacouna, as well as that contributed by the sportsmen who haunt the forests throughout the region. But this influence is more than offset by the strictly French and Roman Catholic character of the population. Indeed, the region is likely to prove uncongenial to the immigrant or visitor who lacks a knowledge of the French tongue and a devotion to the Catholic faith.²

Historical Evidences of Isolation³

The conditions of isolation which have been summarized in the foregoing have made themselves felt in the human history of the region from the first, and it remains only to point out these elements in its history and to give a few present-day evidences of its remarkable provincialism.

MEAGER COMMERCE OF NEW FRANCE

Colonial stability is based upon a commerce with the mother country. In a large measure this commerce depends upon the natural resources of the region, but in a lesser degree the economic condition of the mother country and the difficulties of intercommunication play a part. In the fifteenth and sixteenth centuries, New France had but one product upon which to base her commerce, namely, fur. A variety of commercial experiments failed. Agriculture labored under disadvantages, and it was long

² E. C. Semple: The Influence of Geographic Environment on the Lower St. Lawrence, *Bull. Amer. Geogr. Soc.*, Vol. 36, 1904, pp. 449-466. Substantially the same paper is published under the title "The North-Shore Villages of the Lower St. Lawrence" in "Ratzel Gedenkschrift," Seele & Co., Leipzig, 1904, pp. 351-360.

³ The authorities from which has come the mass of the historical material are G. M. Grant, Francis Parkman, E. C. Semple, Benjamin Sulte, R. W. Thwaites, F. J. Turner, Justin Winsor.

before the demand for food within the settlement was supplied by home produce. The greatest obstacle to husbandry was one peculiar to these settlements, in contrast with the English colonies. This was the shortness of the growing season, an adverse condition which the sixteenth century was ill equipped to contend with, for it was ignorant of our science of plant selection. The fact that a crop was of the first importance to the human beings who desired it did not keep it from failing. The country was not adapted to the growth of certain of the most nourishing products. Maize, for example, which was so great a blessing to the English colonies, could not be raised in New France.

But yet another factor, equally vital to industrial development, was lacking. This was industry of the sort that perseveres under all the discouragements of monotonous toil. Fur trading was an easy road to wealth, and this, together with the pleasures of hunting and fishing, encouraged indolence in the settler. He was content to be fed from the ships that came for furs. Thus the colony endangered its relations with France by being a constant drain upon her, by offering a single article in commercial exchange, and by having little or no economic independence. The difficulties of communication in those days of small boats need not be emphasized. A sailor might be held in inaction for several months awaiting favorable winds to take him across the ocean. One case is recorded where the New World was actually sighted by the eager sailors, when a storm arose which blew the helpless ship all the way back to France. Even with favorable winds the journey was long and perilous. Quebec, the one important port of the region, was, moreover, closed for five or six months of the year.

Thus the centrifugal force which tends to break a colony from its parent country was great in the Lower St. Lawrence. The centripetal tendency, commerce, was weak. Once the colony began to feed itself, the feeble commercial intercourse and the difficulties of traversing the long distance tended to give to the valley an independence of and lack of connection with France. This isolation was made the more complete by the vast wilderness which separated New France from the other American communities. The characteristics which were the inheritance of these settlers, their customs and modes of living, solidified. The men and women of New France drew upon tradition for their ideas and ideals and remained almost untouched by those influences from outside culture which incite to progress.

ISOLATING FACTORS AT TIME OF SETTLEMENT

These powerful factors isolated New France, or the whole of Lower Canada; but there are physical characteristics peculiar to the Lower St. Lawrence Valley which have been and still are potent in isolating small groups and even individuals.

The river itself was not the least of these. It was the primitive highway, and in the earlier days of settlement each man thought it essential that his



FIG. 3.



FIG. 4.

FIG. 3—The Côte de Beaupré along the north shore below Quebec, at Ste. Anne de Beaupré. Isle d'Orléans forms the opposite shore. Causeways lead from the main highway across the meadows to landing places, which occur at frequent intervals. (Photo by Isaiah Bowman.)

FIG. 4—The Beaupré highway at the foot of the lowest coastal terrace. The nearness of the houses is due to the narrow river-frontage of the farms (see legend of Fig. 2). Note the plastered houses, the bird cages at the eaves, the thatched barn, and the hewn-log construction.



FIG. 5.



FIG. 6.

FIG. 5—A farm group in the Gouffre valley on the north shore. The Norman architecture of the house in the background is an interesting survival from the mother country. The light-colored straw on the ridges of the thatched barns was put on as late as the summer of 1916. To the left of the barn is an oven house. The crop in the enclosure is tobacco.

FIG. 6—A former manor house, Baie St. Paul. Norman architecture.

farm should have a frontage upon the river. Not only was the river the highway, but it provided fishing opportunities as well. Moreover, the majestic stream deeply affected the minds of these imaginative settlers. It was the connecting link between the clearing and the little trading post; it gave the pioneer a sense of confidence and a courage to venture far in search of good land, while its friendly, open expanse mitigated the gloom



FIG. 7—A boat with lumber on the Saguenay River. Note the precipitous character of the cliffs in the background. (Photo by Isaiah Bowman.)

of the trackless forests, the home of the savage and the wild beast. To show how prodigal the people were of territory, the parish of one of the early Jesuit priests, Père Morel, included the 27 leagues from Rivière du Sud to Rivière du Loup and contained but 326 souls. Louis XIV attempted the establishment of three compact villages near Quebec and gave the people land and houses to occupy; but the river called, the people deserted the villages and returned to their former homes along its bank (Fig. 4). Nor were the settlements continuous even there. Topography and soil were the controlling factors in the location of the earlier settlements; and, as has been shown in the first part of this article, topography and soil were not always favorable. The sterility of the uplands and their inaccessibility from the river, especially upon the north shore, the morasses of the south, the meager distribution of the lowland upon the north—all hindered free communication and rendered isolation effective. Nor can we regard the St. Lawrence as a river merely. To the paddler of a canoe this estuary was rather an inland sea than a river. So far apart were the shores that men on opposite banks might well regard each other as foreigners.

These elements of isolation meant a weak defensive against Indians and English. Had the Champlain-Richelieu depression met the St. Lawrence at a point east of Quebec, the marauding parties of the Five Nations might have aroused in the settlers such fear of destruction that they would have concentrated in defensive groups, but these lower reaches were undisturbed by the tragedies of savage warfare, and the people felt little need for co-operation. Instead of the co-operative impulse, a strong independence.

the inevitable result of this scattering, was the outcome. The Crown observed this and issued royal decrees to bring the people nearer together and more directly within its jurisdiction; but these mandates were unheeded. The Church, in order to care for its flock, found it necessary to convert its priests into voyageurs who dared to venture upon long and lonely journeys by canoe, reaching parishioners in the remote wilderness. There was an advantage inherent in this dispersion, however, for while Trois Rivières and Quebec spent their nights in brawling and fighting, the cottages of Beaupré were scenes of pious domesticity. Today the Church still recognizes the moral value of rural quiet and so aids those patriot societies whose object is to prevent emigration and expatriation in keeping the French Canadian at home and upon the farm for the good of his soul.

TOLERANT POLICY OF ENGLAND

That this isolation has been a vital and active factor in shaping the character of the *habitant* we have been assured by historians and geographers, though few of them have described the physical conditions. The great historical proofs are these:

When Quebec fell before Wolfe and the English established themselves over Canada, the *habitant*, a prisoner within the narrow horizon allowed him by his physical environment, demonstrated his indifference to the change of these distant governments as completely as did the imperturbable flood of the St. Lawrence.

The policy of England toward this little nation is again instructive. By the Quebec Act, in 1774, the English allowed the French in Canada "the benefit and use of their own laws, usages, and customs." This meant their flag, their language, their treasured religion, and the parochial system of education. This policy on the part of Pitt was diplomatic to a degree. The disgruntled English colonies to the south were in 1774 already dangerously restive. England's failure to hold them was owing to the distance across which the authoritative arm had to reach and the distractions of successive European wars. Upon Lower Canada, too, this factor of distance would have exercised a powerful influence had she not possessed those natural elements of unity which make for independence. Add to this the geographical conditions, physical and economic, which prevented cultural invasions by the English from western Quebec, and it is easy to see that here was a people whom the English could not coerce into assimilation and who remained indifferent to the making of decrees.

INDIFFERENCE TO THE FRENCH REVOLUTION

While the soul of France was being bled, destroyed, and reborn by the Revolution, the *habitant* quietly tilled his land or pushed his canoe along the lonely streams, feeling only the tranquillity of the forests about him. The stirring principles of republicanism, individualism, and romanticism

which kindled France did not penetrate those backwoods and, what is more remarkable, excepting possibly the first they have not yet penetrated them.

In the present day of catastrophic history the French Canadians, justly or unjustly, are criticized for their lack of interest and participation in the struggle into which both their national mother and their national foster-mother have thrown themselves. So far as the charge is true, we can explain it in part by the fact that the Lower St. Lawrence Valley is an agricultural country of great economic independence, still holding a significant isolation from the rest of the world and, because its communities are scattered, lacking that cohesion necessary to enthusiasm, protest, and partisanship.

Present Evidences of Isolation

This prolonged isolation has produced a provincialism the strength and purity of which is unmatched upon this continent. According to Royce,⁴ a province is a part of a national domain which is, geographically and socially, sufficiently unified to have a true community consciousness, a pride in its own ideals and customs, and a sense of distinction from the rest of the country. Here individuals are molded in a common pattern, and the pattern is provincial. The ultimate of such a provincialism may be an evolution of the inherited type, or, if the environment offers unfavorable conditions for development, it may be a crystallization of the inherited type. In what follows we are to note a few of the many and varied evidences which bear witness that our region is of the latter type. There are many to be found in print, and a sojourn in the region will offer to the inquiring visitor obvious proofs of this crystallization.

LANGUAGE

The language of French Canada is its most striking feature.⁵ It is a speech which has more semblance to the speech of Normandy and Picardy in the sixteenth century than to the language of Paris today. For example *-oir* has the pronunciation of an open *e*, which in France is archaic. Their old legends carry words in ancient forms, as, for example, the preservation of an *s* in *notre* instead of the circumflex. These are but casual allusions; to do the matter justice would require an article in itself. Many of the words in use by the *habitant* of today have a different meaning from the same words as used in France. These are examples of differentiation rather than crystallization. Not a few words are due to the physical or cultural environment, as *alright*, *mail*, and the verbs *mailé*, *canoe*, *beaté* (for beaten). Semple tells us that the *habitant* is so accustomed to the

⁴ Josiah Royce: *Race Questions, Provincialism, and other American Problems*, New York, 1908.

⁵ For much of the journey in the field the writer had the companionship of Mr. Lander MacClintock of the French Department, University of Chicago, and is indebted to him specially as a student of Old French and Old France.



FIG. 8.



FIG. 9.

FIG. 8—A lumber settlement on the Saguenay below Chicoutimi. The abrupt descent to the river of the slopes in the background, leaving only a narrow foreshore for human habitations, is also characteristic of the south shore of the Lower St. Lawrence, especially in Gaspé Peninsula. (Photo by Isaiah Bowman.)

FIG. 9—A ship unloading a winter's supply of molasses and coal at Murray Bay. The shore at low tide is over two miles from here.

canoe and its phraseology that he "disembarks" from his horse and "moors" it to a tree.⁶ One is hailed with *benevenu* as he enters a cabin.

FOLKLORE

Recently Dr. C. M. Barbeau of the anthropological staff of the Canadian Geological Survey collected several hundred old legends, ballads, and verses from the natives of the more out-of-the-way villages which preserve in Old French the legends of northern France, such as Tristan and Isolde, a certain version of the Faust story, and the tales of the Round Table. These are still cherished and told by the simple people, who, little influenced by the complexities of the world and the extension of literature, retain these tales in their mind word for word and pass them on to succeeding generations.

I went with Dr. Barbeau to the cabin of an old man who was noted for his versatility in the art of ballad singing, and, as he sang to us, his daughter at the far end of the room crooned the words to the baby suckling at her breast. Unless the railway invades this town, bringing with it the distracting influences of outside culture, the baby will grow up to know and love these songs. Should the railway penetrate to Tadoussac, the chances are that the child will read the newspapers to the exclusion of the old songs; that Sir Galahad will be replaced by the Canadian Nick Carter, whoever he is; and that a beautiful example of the preservation of type, tradition and talent through isolation will be lost.

THE CHURCH

Another element of the French Canadian which illustrates crystallization and in a most significant manner is his mental attitude. He exhibits a simple faith which exceeds that of all his contemporaries in other portions of the American continent and to many is absolutely unknown. The beginning and the end of the *habitant's* thought lies in the Church. The grammar school, the college, and the newspaper turn to the Church to learn the limits beyond which their intellectual advance must not proceed. From youth to old age the Church's influence is constantly felt. The mass is the one event powerful enough to bring the entire population together, and there is scarcely a storm which can keep the farmer, however remote his home, from attending it. The *habitant* is medieval in his superstitions and absolute in his faith. Let the pile of crutches at the shrine of Ste. Anne de Beaupré bear witness. I have spoken elsewhere of the effect of this isolation upon morals. The Church, aided by the encompassing hills, has brought to these people a peace of conscience and a moral sense which are sublime. Nowhere else have I seen such temperance and orderliness of life.

FEUDALISM

There still exists here a modified feudalism, a survival of the seigniorial system. In Charlevoix County (Les Ebonlements and Malbaie), upon the

⁶ *Op. cit.*, p. 464.

north shore, and in a number of counties upon the south the land is held by a *seigneur* who may extract a fee from the *rentier*. He has full title vested in him by an ancient and royal grant, but today the rent that he may charge is regulated by law. The limit varies and may be as low as one-tenth of one per cent of the assessed value of the farm. M. Audet of Les Eboulements explained to me that the rent on his modest *pension* and the adjoining blacksmith shop was six dollars and a chicken annually, though recently the chicken had been "abolished." Today his *seigneur* rides over the estate upon a fine horse, and the peasantry stand beside the road to doff their hats. Beyond tradition and the modest fee this man has no rights of civil jurisdiction. The *habitant* may buy the land and frequently does, though because of centuries of occupation by the same family it is already virtually his. This buying up of land, together with hostile legislation, tends to do away with the un-American archaism of feudal observances.

ARCHITECTURE

There are a host of other evidences of this ancient and little-modified civilization. In the older houses the architecture is distinctly Norman (Figs. 4, 5, 6), and when houses are rebuilt it is often along traditional lines. Barns were being re-thatched in the summer of 1916 in the Gouffre valley (Fig. 5). The corbeled second story so popular in Normandy is a common sight. Windmills of ancient wooden types are used throughout the south shore and upon islands exposed to the strong northwesterly winds blowing down the estuary. These clumsy mills are used mainly for threshing the grain but also for grinding it. At Trois Pistoles I found a modern barn to which was attached this old-fashioned contrivance. Within a mile of this barn men were building a shed over a newly constructed Old World oven such as is to be found on every estate in the region (Fig. 5)—this, too, in spite of the fact that there was in the house a modern range containing an oven. This reluctance to give up old customs, or to introduce innovations in a community where all have customs so much in common, is a characteristic and highly important indication. On Isle aux Coudres, which is monotonously flat once you have ascended the twenty-foot terrace, the carts are two-wheeled. This is a relic of the days when a Norman wheel tax made two wheels more economical than four. It is asserted by the loyal *habitant* that two wheels are better for certain sorts of rough road; but as a matter of fact the roads are not rough, and the conditions are the same as on the mainland of the south shore where the farmer uses four-wheeled carts to advantage. This difference of accessibility in various portions and corners of the province always brings out a variation in the degree of advancement of the inhabitants. Only in the poorer and less accessible regions was Dr. Barbeau able to find the old tales in any considerable number.

EXAMPLE OF PROVINCIALISM

This type of evidence could be given *ad infinitum*. One more example, however, must suffice. Royce's definition of provincialism requires that the individual succumb to the characteristics of the group. After the British "conquest" English and Scottish soldiers settled down at Murray Bay (Malbaie) and Fraserville (Rivière du Loup), towns which they named after their commanders. Today there is no trace of such settlement except family names. The descendants of these English and Scottish soldiers are French in thought, religion, language, and appearance. They have, of course, intermarried. At Bic I shared the Sunday dinner of a shoemaker. He could not speak a sentence of English, and yet his ancestral country was the same as mine. His name was Robert Burns.

OUR WATERWAY REQUIREMENTS

By ROBERT M. BROWN

Legislation

FALLACY OF PRESENT POLICY

The River and Harbor Appropriation Bill passed in July, 1917, originally carried \$38,000,000 to be distributed among 300 projects, 81 of which are new. In the report of the Committee on Commerce¹ in 1916 it was explained that a few waterways for which appropriations were made accommodated relatively a very small commerce because of the uncompleted state of the waterway, business depression, or "local causes of a temporary nature." The Committee in all cases continued the appropriation on these projects "in the hope that increased benefits may follow," but with the threat that unless an increased traffic be shown in a reasonable time the appropriation for maintenance would be discontinued. Herein lies one of the greatest fallacies of waterway management, namely, that commerce will result from waterway construction. Waterways should be improved, not to create commerce; commerce should create them.

INADEQUACY OF SPECIAL BILLS

There are some signs that an omnibus river and harbor appropriation bill may be succeeded in time by a commission-governed waterway appropriation. A few years ago the Newlands Bill² began a consistent fight for a new waterway policy. The failure of this bill was the result, probably, of its altruistic character—the detailing of an enormous sum of money into the hands of a few people without definite instructions as to expenditure—and of its lack of promise of quick results. The minority report of the last river and harbor appropriation bill³ advocated a national waterway commission⁴ with exclusive authority over waterways as the one way out of the difficulty. The recommendations of this commission would be under Congressional approval, and, if the districts of the members were too severely neglected, there would be a chance to block the measure by establishing a deadlock. The Newlands Bill carried a lump appropriation of \$60,000,000 per year for ten years to be placed at the disposal of a commission. Our waterways have suffered, are still suffering, from the unsatisfactory allotments of the annual river and harbor appropriation bill; it may be that a commission management would obviate the evils of this bill,

¹ *Senate Rept. No. 420, 64th Congr., 1st Sess., p. 10.*

² *Senate Bill No. 2739, 63rd Congr., 1st Sess.*

³ *House of Repr. Rept. No. 1289, Part II, 64th Congr., 2nd Sess.*

⁴ *House of Repr. Bill No. 6821, 64th Congr., 2nd Sess.*

but at the same time there is some danger of establishing a form of government over waterways which would be only different in name.

Special bills calling for specific action on waterways are introduced into Congress during every session, and these, unless they are in accord with a national waterway policy, may be a great menace to our waterway system. For instance, there was introduced into the House of Representatives a bill⁵ to provide for the control of the Mississippi and Sacramento River floods. The passage of such an act would be disastrous, probably, to all other functions of the river. Flood control is one of the necessities of waterways but it must be managed in such a way that navigation be not blocked, reclamation and protection be permitted, and water conservation be maintained. Since 1896 we have expended over \$560,000,000 through the medium of the river and harbor acts, an average approximately of \$27,000,000 per year. As a large amount of this money each year is appropriated for maintenance and not for the continued improvement of partially regulated streams, and as some of it is expended for projects of an experimental nature many of which are abandoned later, it is not an exaggeration to state that some of this money has been wasted. A strict accounting of this sum during the last twenty-one years would probably yield astonishing results. It is, of course, purely a mental exercise to figure out what would have resulted from the expenditure of this sum of money by a competent waterway board on one worthy project each year for twenty-one years, not in maintenance amounts but in sufficient quantities to complete each waterway and to make it an effective carrier of traffic.

AIMS OF VARIOUS ORGANIZATIONS

In addition to the bills of special nature, there are a number of powerful associations which, each devoted to a certain project and backing it with great persistence, have a narrow or limited view of our waterway problem. These groups are interested naturally in the task nearest at hand. The Mississippi River Levee Association has done an amount of commendable work in advertising the necessity of protection for the Mississippi Valley; but, in advocating one type of remedy to the exclusion of all others and in demanding protection at the expense of proper uses of the great river, this association has not been a national asset.

The Mississippi River Commission can point to a long record of service, but the act that created it does not permit the commission to conduct its endeavors along approved lines of water conservation, and furthermore it has committed itself to levee completion as the only method of protecting the alluvial basin to such a degree that no other policy can be entertained by it. In twenty-eight years two-thirds of the necessary yardage of levees have been completed. Out of 1,564 miles of levees in the system 1,237 are today below commission grade. Nearly a fourth of the area seeking pro-

⁵ *House of Repr. Bill No. 14,777, 64th Congr., 2nd Sess.*

ection was overflowed during the 1916 flood. An excessive flood, which may occur any year, will always be disastrous to the basin under this régime. The commission has maintained a nine-foot waterway of 250 feet width since 1902 except that "for 18 days in 1903 and a few days in 1904 the depths at one bar were 8 and 8½ feet. For a few days there was less than 9 feet at five bars in 1908, seven bars in 1910, and five bars in 1914. At one bar in 1913 the required width was not maintained."⁶ This is not a very commendable record of achievement for twenty-eight years: the fault may lie in the plan of appropriations or it may lie in the policy of the commission or in both.

The Atlantic Deeper Waterways Association rarely comes into conflict with the riverway organizations except as a factor in the distribution of the annual appropriation. The demand for a fourteen-foot channel from the Great Lakes to the Gulf was as dangerous and as purely selfish a measure as has existed in recent years. A few years ago the St. Louis convention of the Lakes-to-the-Gulf Deep Waterways Association sent a resolution to Congress 'demanding that no less than fourteen feet should be permitted and should be accepted.'⁷ It was a movement tending to improve the situation of a small region to the neglect of other regions. The Ohio River, now the best traffic carrier of the Mississippi Basin, could not be joined to such a system except at a cost that would in itself be prohibitive. There was little reasonableness in the demand for a fourteen-foot depth, as the Lake carriers could not be floated economically in so shallow water and the river steamers were of a much less draft. As long as transshipment is necessary the nine-foot channel of the Mississippi River Commission, which has been maintained fairly consistently, is of sufficient depth. It is a mooted question whether even this nine-foot channel has been worth while.

In addition to these pleaders for special waterway privileges and others of similar complexity, there have been unorganized adherents to a special line of action. The most vigorous of these today is the reservoir-control group. This form of regulation has not been adequately tried out on large streams, and for this reason the arguments of this group have neither been proved nor refuted.

LACK OF NATIONAL POLICY

It is evident that in our waterway policy we are a house divided against itself. The excellent reports which have been issued in recent years—the Final Report of the National Waterways Commission, 1912;⁸ the Report of the Inland Waterways Commission, 1908;⁹ and the Survey of the Mississippi River by a Special Board, 1909¹⁰—have perhaps accomplished something,

⁶ Annual Report of the Mississippi River Commission for the Fiscal Year Ending June 30, 1916, in *Rept. Chief of Engineers, U. S. Army, 1916*, Pt. III, pp. 3299-3521; reference on pp. 3302-3303

⁷ *Congressional Record*, Vol. 46, December, 1910, p. 178.

⁸ *Senate Doc. No. 469, 62nd Congr., 2nd Sess.*

⁹ *Senate Doc. No. 325, 60th Congr., 1st Sess.*, edition with appendix.

¹⁰ *House of Repr. Doc. No. 50, 61st Congr., 1st Sess.*, edition with atlas.

but they have not been able to stop the momentum gained by the annual omnibus river and harbor bill nor have they in any marked degree prepared waterway advocates and experts for a uniformity of purpose. There is no such thing at present as a national waterway policy; the strife after a share in the annual appropriation is a catch-as-catch-can affair which is rendered disgraceful by provincialism and political intrigue in Congress. There is no greater need for our waterways today than a definite statement of aim to which most of our waterway adherents would be willing to subscribe.

Natural Factors

LARGE TRIBUTARY POPULATION

Waterways cannot be expected to be successful unless they are connected with a densely settled district. Graphs I, II, III, IV, and V (Fig. 1) show

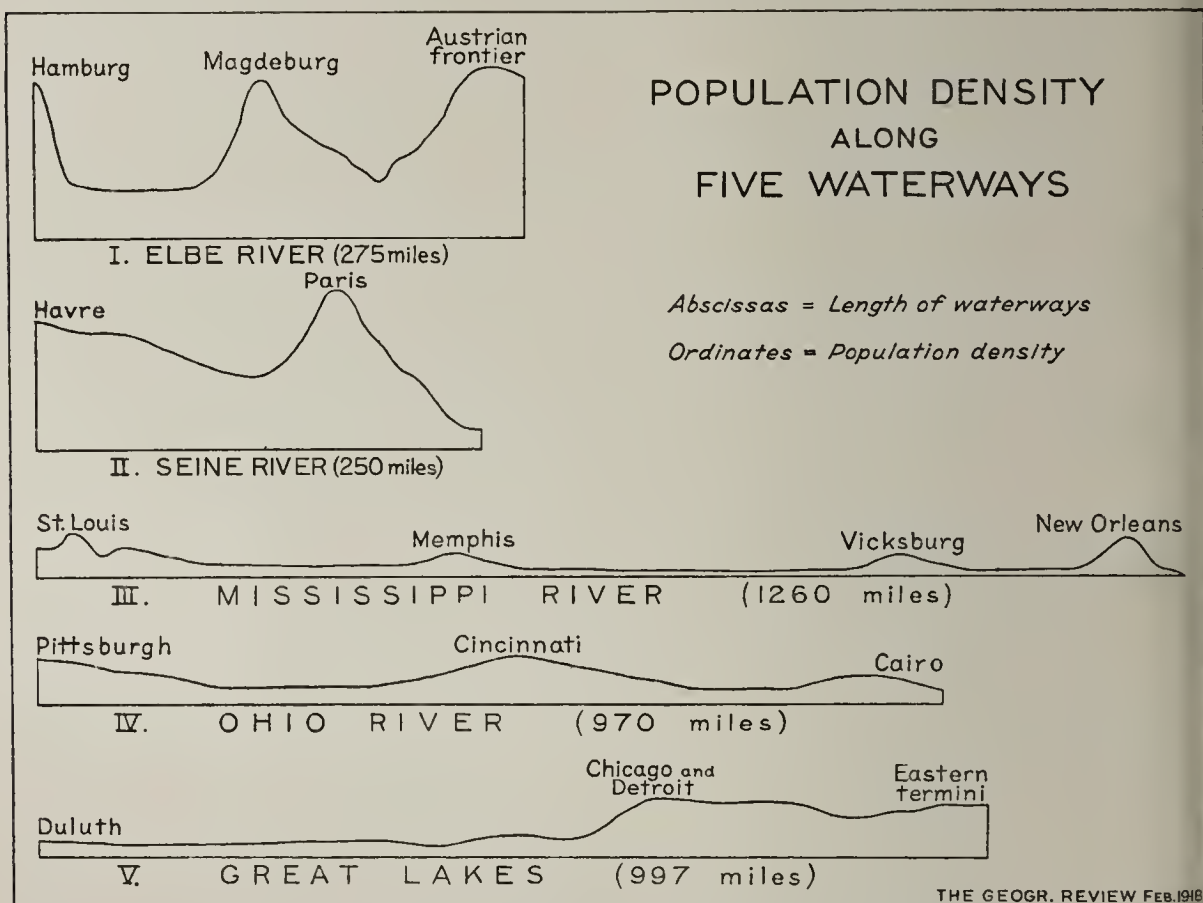


FIG. 1—Curves of densities of population along water routes.

the relative density of population along five waterways. The base lines are proportional to the length of the water routes, and the heights of the curves indicate the relative density of population along the way. The apexes of the Elbe curve (Graph I) mark Hamburg, the Magdeburg district, and the Dresden district (marked "Austrian frontier"); along the Seine (Graph II) the apex indicates the location of Paris; and in the Mississippi River curve (Graph III) southern Illinois (marked "St. Louis"), Memphis, Vicksburg, and New Orleans appear in slight irregularities. The Elbe

River is not adjacent to any coal mine district in Germany, so that the necessity for shipment up river from the port of Hamburg of this commodity to the centers of dense population and industry is great. A similar situation is found on the Seine. The upstream traffic from Havre to Paris exceeds the downstream traffic, and this difference is accounted for by the demands of the densely populated Paris district for coal. Above Paris, the bulk of the traffic, about 75 per cent of the total, is downstream, bringing grain and building materials to the city.

AVAILABLE TRADE COMMODITIES

Not easily separated from the density of population is the commodity factor in waterway success. It is almost an axiom that every waterway, to be successful, must have at its terminals either a dense population or a commodity of trade in sufficient quantity to promise a continual output. In the European waterways used as types above, the centers of great population, besides demanding the necessities of life, ship in return over the waterways their manufactured or agricultural products. Thus the Dresden district (Graph I) ships glassware and crockery, the Magdeburg district ships sugar and machinery, and the Paris district (Graph II) ships a variety of manufactured articles. The Great Lakes waterway illustrates the combination of a dense population and an economic commodity. Around the western terminus there exist in abundance iron ore and lumber, while the northwestern hinterland adds grain and flour. The maximum amount of annual tonnage passing through the Saint Marys Canal up to 1916 was 79,718,344 short tons (1913). Around the eastern terminus (Graph V) there is a fairly dense population which receives the raw materials of the Lake Superior district and converts them into manufactured articles. The Mississippi River has the fertile prairies, and, through its tributary the Ohio River (Graph IV), it taps the coal fields of western Pennsylvania; but along its route there are no thickly settled districts, and its southern terminus, New Orleans, is not a great city. Furthermore, the grain which made a large percentage of the tonnage of the river in the heyday of its commercial supremacy is not conveniently located at the water's edge, is too decentralized, and is thus not destined to be in any large degree a river-borne commodity. During the year 1915 the traffic on the Mississippi River passing any zone, as Memphis to Vicksburg, was 2,198,814 tons, made up largely of stone, gravel and sand (892,940 tons), and coal and coke (892,840 tons).

WATERWAYS AS OUTLETS

Short streams, as for example the western European rivers, become successful waterways independent of their direction of flow because they connect a densely settled interior with the coast by a direct line. In Russia, however, aside from the Neva and the Volga Rivers, very little tonnage is carried by the streams, although they are navigable in the aggregate for

nearly 110,000 miles. The east-and-west rivers through the heart of Russia are the important highways. The north-flowing streams to the Arctic and the south-flowing streams to the Black and Caspian Seas do not parallel heavy traffic lines, and consequently they bear little tonnage. A similar difficulty confronts the Mississippi River; its big tributaries open through the main stream to the sub-tropical regions rather than from one economic region to another in the middle zone, and it is thus of secondary importance as a waterway.

Development

NECESSITY FOR AN ADEQUATE CHANNEL

Given the natural factors for a successful waterway, one necessary essential is an adequate channel. We have been under a double illusion for a long period of time over the waterway situation: on the one hand we are tempted to believe that commerce will result from river improvement and on the other we believe that railroad freight rates can be lowered by improving waterways. A waterway policy built upon faith will be a failure. Improvement of waterway channels is legitimate only where trade demands more or better carriers. When this stage is reached, it becomes a profitable investment to spend large sums of money to facilitate the movement of boats.

A national waterway scheme should attempt some co-ordination in the depth of the channel. A three-foot waterway on the upper Mississippi River increasing gradually downstream to a nine-foot waterway is not economical. Our railroad companies adopted independent policies of road gage in their earlier history, but the advantages in economy and time of a standard gage have driven every line of any other gage out of business today. The expense of unloading and loading at the stations where the river depth changes is argument enough against such a plan. The fourteen-foot waterway demand of the Lakes-to-the-Gulf Deep Waterways Association and the nine-foot waterway of the Mississippi River Commission are examples of the lack of uniformity in waterway ideals.

The time element must be considered as a factor in a successful waterway policy. Many of our great canals have been built to shorten sea routes. The more direct the route between any two points, the more profitable it will be. The great meanders of the Mississippi River make the distance from Cairo to New Orleans over twice as great by water as by rail. It is frequently claimed that the Rhine, in spite of its great meanders, is a successful waterway. It will be found on investigation, however, that the stretch of the Rhine from Mannheim, at the mouth of the Neckar and in the lower part of the great agricultural lowland, to Rotterdam carries most of the commerce of that stream. This stretch is remarkably free from windings, and the distance from Mannheim to Rotterdam by water, 351 miles, is only 41 miles (13 per cent) greater than that by rail. Our early railroads were a combination of grades and curves; these have been or are being elimi-

ated, sometimes at great expense. In like manner a successful waterway must straighten its line and employ as few dams as possible to be circumvented by time-consuming lifting and lowering contrivances.

Impediments to navigation should be eliminated as far as practicable. The uncertainty of most of our rivers has been a great handicap. On the Kentucky River¹¹ since the opening of the slack-water project some of the locks have been out of commission for a part of the time every year, being damaged by freshets or ice. In 1909 navigation was entirely suspended for 138 days and again in 1912 for 40 days. It is a sad commentary on our waterway policy to note that when all the commodities of the upper Kentucky River were, because of the uncertainty of the river way, accepting the higher tariffs of the railroads, the slack-water project, which, too, was never successful because of its inadequacy, became an obstruction to the shipment of lumber, the only industry of importance in the upper river today. The result has been that some of the lumber mills below the dams have had to go out of business, and mills have sprung up above the dams. A frequent obstacle to navigation in nearly every river in the country is the excessively high or low water stage of the stream, but this difficulty is one that in most rivers can be easily overcome.

REDUCTION IN OPERATING COST

A decrease in the cost of handling commodities and of operating is another essential to a successful waterway. Here lies one of the reasons for a standardized canal system, especially on shallow streams. Railroads send cars from producer to consumer under the régime of a standard rail gage. The ocean and Great Lakes traffic lines and the Ohio coal carriers have reduced overhead charges to a minimum and have achieved success. Terminal facilities of most river stations, however, have not improved since their inception. It is reported¹² that the number of pounds of fuel expended per ton-mile is on the average for the railroads 0.066; for the Great Lakes carriers, 0.029; for the Ohio River tow boats, 0.021; and for the Mississippi River packet, 1.129. Evidently the packet is not the most economical carrier. In the number of days' labor per 100,000 ton-miles, the same authority quotes for railroads, 2.5; for the Great Lakes carriers, 0.9; for the Ohio River tow boats, 1.31; and for the Mississippi River packets, 63.64. The geographers who walked over the wide sloping cobbled approach to the steamer which took the Transcontinental Excursion of the American Geographical Society down the river in 1912 from Memphis can easily believe that the expense of loading and unloading a Mississippi River freight boat must be excessive. When there is proper equipment and the haulage is moderately long, so that the expense of terminals is distributed over a considerable

¹¹ Mary Verhoeff: *The Kentucky River Navigation*, *Filson Club Publs. No. 28*, Louisville, 1917.

¹² W. M. Black: *Some Problems of Inland Waterway Transportation*, *Rept. of Proc. of the Ninth Ann. Convention of the Atlantic Deeper Waterways Assoc. Held at Philadelphia, Sept. 12-15, 1916*, Philadelphia 1917, pp. 54-69; references on p. 68.

mileage, water transportation rates are lower than rail rates. This is true on the Great Lakes, where one ton of iron ore is transported an average distance of approximately 850 miles for 65 cents (including cost of loading and unloading, carrying, and terminal charges), or at the rate of less than eight-tenths of a mill per ton-mile; and also on the Ohio River for the 2,000 miles from Pittsburgh to New Orleans, where the charge is \$1.25 per ton for coal, or at the rate of about six-tenths of a mill per ton-mile. The lowest rail rate on coal in the United States is two and one-half mills per ton-mile.

Railroad competition has been frequently assigned as the reason of the declining traffic on our waterways. In many instances, however, the waterways have been so inefficiently managed that competition is hardly the proper word to use. Many waterway advocates, furthermore, charge the railroads with malicious competition and demand in strong terms federal control. Legitimate railroad competition with any waterway is particularly formidable because of the ability of the roads to keep their lines open under varying conditions, to move freight quickly, to overcome the decentralization of products by numerous inter ramifications of lines, and to transport commodities without break of bulk to a greater extent than can be effected by any waterway system. The time is going by when railroads can be charged with manipulating rates in order to offset competition, and when waterways can be advocated as a factor in railroad rates. Formerly waterways exercised a potent influence in rate reduction, but this influence was extremely limited in extent, and the loss which the railroads suffered because of waterway competition was generally charged against the public on roads that had no competing line. The extension of the powers of the Interstate Commerce Commission throughout the country will be instrumental probably in controlling traffic rates so that the injustices of former years can no longer be alleged.

CONSIDERATION FOR A RIVER'S OTHER FUNCTIONS

Finally, a river waterway should be so regulated as to allow the river to perform its other legitimate functions, and, conversely, other uses of the river should not block its use as a waterway. It is to be understood, however, that the waters of some streams may properly be devoted to a particular purpose to the exclusion of all other uses, as, for instance, in the great reclamation projects of the arid areas of the United States; but wherever it is possible the waters of the streams ought to serve many uses. River regulation, navigation, flood control, water conservation, and water utilization—all must be considered. Organizations promoting a Lakes-to-the-Gulf fourteen-foot waterway or any single-feature project are detrimental to a national waterway policy, since they base their demands on provincial and therefore selfish interests. Improvements on any stream which sacrifice one function of the waters to another are wasteful and undeserving of Government sanction.

OCEAN TEMPERATURES OFF THE COAST OF PERU

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TEMPERATE WATERS IN TROPICAL REGIONS

No feature of the coast of Peru is more significant as affecting the character of its marine fauna and flora than the Humboldt, or Peruvian, Current. It is scarcely necessary to apply the limitation "marine," since the climatic conditions of islands and mainland are so profoundly affected by the contiguity of a cold stream and land warmed by a tropical sun that no animal or plant life, terrestrial as well as marine, can escape its effect. In a previous paper¹ on the general fishery conditions of the coast, I stated:

To find upon the coast of the United States a summer temperature of the ocean water corresponding to that of Callao at 12° S. one would go to about the latitude of New York on the Atlantic side (41° N.) or Monterey on the Pacific (36° N.). The Peruvian Current, in conjunction with other factors, particularly the constancy of the winds of the coast, produces a relative uniformity of temperature conditions. There is little variation in the water temperature from hour to hour during the day, little difference from month to month during the year, and a relatively small change from latitude to latitude. It is probable that such variations as are found are due more to very local conditions, or to the swinging of the current, than to seasonal changes or differences of latitude.

With such low water temperatures a tropical fauna is, of course, absent. Corals are wanting, sponges nearly so, and the general character of the fauna and flora of the region is such as would ordinarily be found in much higher latitudes.

Comparatively recently several reports on the fauna and flora of the coast have appeared², based on the writer's collections; it may, therefore, be of particular value to give in greater detail the observations upon which the general statements were founded. A qualification is freely made that the temperature records cannot pretend to the most desirable scientific accuracy. The best instruments were not regularly available. The observations were made during nearly twenty months of travel in 1907-08, often under rather difficult conditions and with other objects in view. While it may be regretted that the need of an adequate supply of tested thermometers was not anticipated, it is clear that a slight error in individual readings will not affect the bearings of the data upon the general conditions of animal or plant life.

Two striking illustrations of the effect of the temperature upon the distribution of semi-aquatic animals may be mentioned. A fur seal is familiar to the Peruvian fishermen under the name of *lobo fino*, or *lobo de los pelos*,

¹ "The Fisheries and the Guano Industry of Peru," Proceedings of the Fourth International Fishery Congress, *Bull. Bur. of Fisheries*, Vol. 28, 1908, Pt. 1, pp. 333-365.

² Mainly in *Proc. U. S. Natl. Museum*, Vol. 37, 1909, and Vol. 38, 1910, *U. S. Natl. Museum Bull.* 95, 1917, and *Memoirs Torrey Botan. Club*, Vol. 15, 1914.

and seems to range as far north as Paracas Bay at 14° S. latitude where it is supposed to breed. The penguin, generally associated with higher latitudes, is here common within the tropics. I observed it as near the equator as the Lobos de Afuera islands, about 7° S. It may be added that while sea turtles are common on the coast it could not be learned that they made nests upon the beaches south of Tumbes, $31\frac{1}{2}^{\circ}$ from the equator and it is extremely improbable that they would breed on the colder shore to the south.

There is an abundance of pelagic life that is not characteristic of tropical latitudes. The influence of the ocean temperature conditions upon the marine fauna and flora is, indeed, too complex and far-reaching to be susceptible of brief analysis. In the first place, the proximity of cold waters and warm lands creates a condition that makes condensation and rainfall virtually impossible. Innumerable small surface organisms are saved from the destruction that might be caused by excessive precipitation; and the clear sunlight is of inestimable value for the growth of the minute plants that form the basis of the food supply of all the marine animals. The higher value of colder waters for absorption of the gases necessary for organic life, the remarkably slight daily and seasonal variations of temperature, the absence of conditions to promote evaporation—these and other features of the Peruvian waters must be reflected in one way or another in the abundance and variety of the animal and plant life.³

UNIFORMITY IN TEMPERATURE CONDITIONS

It is probable that such variations as are found are due more to very local conditions or to the swinging of the current than to seasonal changes or differences of latitude. For example, at Lobos de Afuera (7° S.) during the twelve days March 16 to 28 (range of temperature 19° - 22.4° C.) the average of the records taken at noon was but three-tenths of a degree Centigrade higher than the average of those at 8 A. M., or two-tenths higher than the records at 8 P. M.; and at Lobos de Tierra ($6\frac{1}{2}^{\circ}$ S.), nearer shore and less directly in the current, the noon average was only seven-tenths of a degree greater than the identical averages of morning and evening readings. The extreme readings during nine days of bright weather were but one degree apart (20° - 21° C.).

These records at the islands of Lobos de Afuera and Lobos de Tierra were made at the very close of the summer. At the beginning of the following summer (December) records were again made at the same places, with the result that the averages were 2.3° and 1.7° lower, respectively, than before. It may be noted that at the beginning of summer the current is flowing from a region which has been passing through winter, while at the

³ "No waters in the ocean so teem with life as those on the west coast of South America," says Buchanan (J. Y. Buchanan: *On the Similarities in the Physical Geography of the Great Oceans*, *Proc. Royal Geogr. Soc.*, Vol. 8, 1886, pp. 753-770, with map and diagrams; reference on p. 766.)

end of summer the current is passing from a region that has been in summer, and this may partly explain the fact that the early summer temperature noted was lower than the late summer temperature of the preceding season. It is possible, too, that conditions of a more temporary nature may have caused the small but readily appreciable differences.

At Callao, 12° S., I found summer water temperatures of 15° - 19° (59° - 66° F.) and winter temperatures of 16.5° - 19° (62° - 66° F.).⁴ That the winter temperatures were higher than the summer is attributable in part to the fact that these records were made in the mole instead of in the bay (as in summer), and experience shows that the water in the bay is one or two degrees colder than that in the mole. Also, doubtless, the temperature of the stream as a whole is slightly higher at the close of summer or in early winter than at the close of winter or in early summer, and it so happens that the Callao records were taken chiefly in early winter and in early summer.

The *Albatross* records of November 12-22, 1904, to be referred to again, were two degrees higher (19° , 20° C.) than my records of the same month in 1908.

A winter tourist might travel on the coast of Peru a distance equal to that from New York to Nassau or Miami, Florida, without finding a substantial difference in the temperature of the water for bathing. Thus, fifteen records at Paita (5° S.) in April and May, 1907 (end of summer or early winter), gave an average of 18.4° , and the lowest was 15.5° ; while two records at Paita of December 29 and 30, 1907 (midsummer), were 17° and 17.5° , taken close to shore and about 8 P. M. A record at Chimbote (9° S.) in the same month of May was 17.5° ; at Callao, May

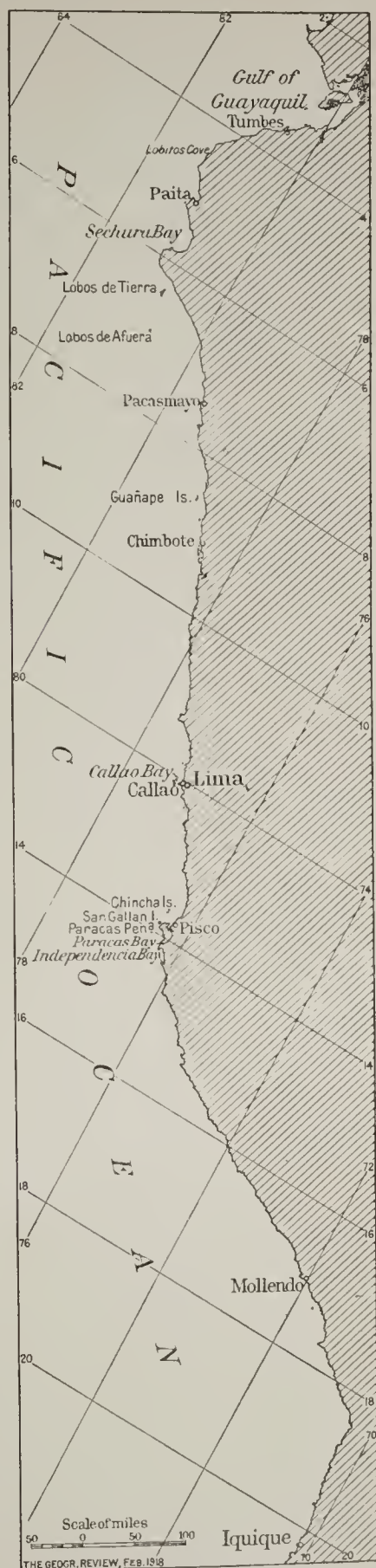


FIG. 1.—Sketch map of the coast of Peru showing the location of the places mentioned in the text. Scale, 1:13,600,000.

⁴ Compare the record for Callao shown in Fig. 76 of Isaiah Bowman's "The Andes of Southern Peru," New York, 1916. This record shows land and water temperatures from June to September, 1912.

20, 16.5°; while at Mollendo (17° S.) in midwinter, 1908, the water was at 16°.

While I have not such a systematic series of records as would justify inferences regarding the nature of the current, I can interpret the relations of 326 records taken at many points between Paita and Mollendo, from January, 1907, to July, 1908, only on the following tentative assumptions:

(a) That the Peruvian Current undergoes little change of temperature in traversing the 1,000 knots from Mollendo to Paita.

(b) That such differences as occur in my readings are due in small part to seasonal changes, likewise in small part to a want of temperature homogeneity in the current (with areas of warmer and colder water), or to the swinging of the stream toward or away from the coast (movements that are assumed by the fishermen), but in greater measure to entirely local influences. Allowance should probably be made, too, for differences from year to year according to the prevalence of icebergs in the southern seas or to other conditions affecting the stream at its origin.

COMPARISON OF SOME "ALBATROSS" RECORDS OF 1904

Examination of the dredging and hydrographic operations of the *Albatross* in this region in 1904⁵ reveals an interesting fact. Near Seehura Bay (5° 46' S., 81° 27' W.) November 12, 1904, the surface temperatures were 63°, 64°, and 65° F. (17.2°-18.3° C.) in different localities. As the vessel sailed westward and southward across the Peruvian Current and away from the equator, the temperature rose to 69° at about the eighty-fourth meridian, 71°-72° at the eighty-sixth, 69°-73° at eighty-seven and a half, and 69°-70° near the ninetieth at latitude eleven to fourteen degrees south. Returning eastward, the temperature fell to 66° at about the seventy-eighth meridian and twelve degrees south. The records made in the region of 78° W. and 12°-13° S. (vicinity of Callao) were 66° and 68° F. Hence it appears that, although the *Albatross* went toward the source of the current for six degrees of latitude, from Seehura to Callao, the surface water was found to be 2° to 5° Fahrenheit warmer in the higher latitude, or farther removed from the equator, even near the coast. The explanation of this is not apparent. Again, in crossing the stream and passing into the central eddy, as it were, the water was found to be 7° or 8° warmer, although the latitude was about eight degrees higher.⁶ It should be remarked, however, that these latter temperatures, being found farther off shore, were therefore in waters removed from the influence of any conditions that might cause an upwelling of colder bottom waters along the coast line.

⁵ Dredging and Hydrographic Records of Fisheries Steamer *Albatross* for 1904 and 1905, *Bur. of Fisheries* Doc. No. 604, 1906, pp. 54-58.

⁶ Compare the figures obtained by Capt. Paul Hoffmann and quoted by Hann (Julius Hann: *Handbuch der Klimatologie*, 3rd edit., 3 vols., Stuttgart, 1908-11; reference in Vol. 1, p. 173). The water temperature of 18.2° on the coast of Callao increased progressively to 27.0° at 135 nautical miles from shore.

POSSIBLE SIGNIFICANCE OF VERTICAL CURRENTS

The possible significance of such a phenomenon has been called to my attention by Professor C. A. Kofoed. On the western shores of other continents its operation is evident. The case at first thought seems less clear for an upward movement of waters along the Peruvian coast. There is at no season a prevailing offshore wind, since the conditions are practically always such as to cause a drift of air from the colder water to the warmer land. We have, indeed, a practically uniform current with a following wind, paralleling or impinging against a generally unbroken coast line.⁷ It is perhaps in the momentum or centrifugal force of the current, bearing against a westward-tending coast, that a cause of upwelling may be found. The effect of the momentum would be to cause the entire periphery of the stream to slide up the continental slope; but the water will not pile up against the coast to any great extent, because, under the influence of gravity, the surface waters would roll away from the coast, thus being continually replaced at the surface near the shore by waters from below. The practical result of these movements would be a slow peripheral upheaval, the direction tangential to the course of the stream and the curve a long spiral. Some evidence bearing on this suggestion might be obtained by comparison of temperature conditions at points farther south, where the coast line has no westward inclination, as at Iquique, Antofagasta, and Valparaiso. I do not find that there is in my records anything to throw

⁷ It would seem important, however, to distinguish between the local development of the winds along the coast—where land and sea breezes play so prominent a part—and the conditions out at sea, where the trade wind drives the surface water from the southeast, inducing a compensatory rise to the leeward strong in proportion to the remarkable strength and development of the trades in the Southern Pacific. This would seem the basal influence, providing the conditions under which the local wind operates. On this question the references given by Hann (*loc. cit.*) should be consulted. It may here be noted that one of the strongest arguments in favor of the upwelling theory is the insignificant gain in temperature of the current as it slowly progresses from Valparaiso to Callao, a movement requiring four months. Capt. Paul Hoffmann (Otto Krümmel: *Handbuch der Ozeanographie*, 2nd edit., 2 vols., Stuttgart, 1907 and 1911; reference in Vol. 2, p. 715) found the November temperatures at Valparaiso and Callao to be 14.8° and 14.9° respectively. Again, Buchanan (*op. cit.*, p. 765) found the temperature from Coquimbo (30° S.) to Pisagua (19½° S.) to average 60° F. (15.6° C.), and along the coast from Independencia Bay northward the average was 61° F. (16.1° C.), though local variations were considerable.

In this connection a historical note may be of interest. The theory that the upwelling of cold bottom water causes the cool ocean temperatures off the lee coasts of the continents in mid-latitudes was first advanced, it would seem, in 1871 by the physicist E. Witte (*Poggendorff's Annal. der Physik und Chemie*, Vol. 142, 1871, p. 289) and in 1875 by Capt. L. E. Dinklage, later of the German Hydrographic Office in Hamburg (cf. A. Supan: *Das kalte Auftriebwasser*, *Petermanns Mitt.*, Vol. 37, 1891, p. 293). Later important discussions are to be found in Capt. Paul Hoffmann's "Zur Mechanik der Meeresströmungen an der Oberfläche der Ozeane," Berlin, 1884, and in A. Puff's "Das kalte Auftriebwasser," University of Marburg thesis, 1890. Through the researches of V. W. Ekman of Christiania (*Beiträge zur Theorie der Meeresströmungen*, *Ann. der Hydrogr. u. Marit. Meteorol.*, Vol. 34, 1906, pp. 423-430, 472-484, 527-540, 566-583) the theory has been placed on the firm foundation of mathematical analysis. It is accepted by such authorities as Hann (*op. cit.*), Krümmel (*op. cit.*), Supan (*Grundzüge der physischen Erdkunde*), and Sir John Murray (*The Ocean*). In this country it has been discussed, mainly in its application to the California Current, by Dr. G. F. McEwen (*The Distribution of Ocean Temperatures along the West Coast of North America Deduced from Ekman's Theory of the Upwelling of Cold Water from the Adjacent Ocean Depths*, *Internatl. Revue der gesamt. Hydrobiol. u. Hydrogr.*, Vol. 5, 1912, pp. 243-286; *Peculiarities of the California Climate Explained on the Basis of General Principles of Atmospheric and Oceanic Circulation*, *Monthly Weather Rev.*, Vol. 42, 1914, pp. 14-23; *Oceanic Circulation and Temperature Off the Pacific Coast*, in "Nature and Science on the Pacific Coast" (guide book for A. A. A. S. meeting in San Francisco, 1915), pp. 133-140.—EDIT. NOTE.

much light, either in an affirmative or in a negative way, upon the question of the influence of vertical currents, if such occur, upon the surface temperatures. On the one hand, we do not find the variations we might expect where colder bottom waters are being drawn up to mingle with warmer surface waters. On the other hand, we have to admit that the absence of contrasting temperatures is not evidence that such movements do not occur, but only that they do not occur in such a way as to produce surface areas of markedly different temperatures; and this is what we should probably expect in view of the fact that the conditions tending to cause the vertical movements, if any, are practically uniform, except as they might be more pronounced where the shore line tended more sharply to the west or where the continental slope was steeper.

DIRECT INFLUENCE OF PERUVIAN CURRENT UPON THE COAST

The Peruvian Current is not, like the Gulf Stream of the Atlantic, a remote influence as affecting the shores. It passes in close proximity to the coast, literally bathing the shores, and its effect is enforced by the general absence of shallows and enclosed bays where the coastal waters might be substantially warmed. It is a very evident phenomenon. The fisherman returning along the coast from a short trip to the north feels the force of the current distinctly. Steamers on the coast maintain a ten per cent higher fare for the southern journey than for a trip northward of the same length. Even in a small boat lying at anchor near an island the water may be observed to flow by like the current of a river. An equally striking manifestation of the current is gained when one observes from the heights of an island, such as one of the Guañapes, the line of surf-made foam streaming constantly away to the northward.

It is locally assumed that the current has certain swinging movements, and these are of considerable significance to the fisheries. *Cuando atraca el corriente* and *cuando se aleja* ("when the current approaches" and "when it recedes") are common terms among the fishermen, for such pelagic fishes as the *monito*, *sierra*, *albacore*, *dorado*, as well as the mackerel and *anchobetas*, may abound when the current "approaches," while they are less available when the current "recedes."

It would be interesting to know to what extent, if at all, the Peruvian Current may occasionally be pushed back or overflowed by the northern current. While I am without observations on this point, I would mention the following information furnished me in response to many inquiries. It is not uncommon for a current from the north—locally known as El Niño from its frequency during the Christmas season—to prevail in the region of Tumbes at $3\frac{1}{2}^{\circ}$ S.; a reliable informant told me that he had witnessed a current from the north while at Lobitos Cove, just north of Paita (5° S.), which left on the beach quantities of drift with snakes, etc. Mr. Kaufmann at Pacasmayo told me he had known equatorial drifts and an alligator to

have been left on the beach there ($71\frac{1}{2}^{\circ}$ S.). He regarded the occurrence as remarkable but did not believe there had been any change in the direction of flow. He was inclined to suppose that the drift and the alligator had made a long journey after being carried out on the westward equatorial current.⁸

Indeed, an effective reversal of flow, bringing the warm equatorial or northern waters to displace the southern waters, could hardly be supposed to occur without affecting the fixed marine fauna and flora in a conspicuous and unmistakable way. There is, however, nothing inherently improbable in the supposition that under certain conditions the warmer and lighter equatorial waters might overflow the colder and heavier Peruvian Current to a more southern latitude than usual and thus bring the equatorial drift south to a point where, under the action of the winds, it would be thrown ashore at such a latitude as Pacasmayo. This might occur without manifestation of southward flow along the shore.

DATA BEARING ON LOCAL AND SEASONAL VARIATIONS

The data of local variation in given seasons are of interest in this connection, and for convenience of examination the following tables are offered.

<i>Maximum Local Variation</i>	<i>Minimum Local Variation</i>
Paita, bay protected on the south 5.0° C.	Pisco, bay protected on the south 2.0° C.
Chimbote, bay largely enclosed 4.5	Callao, bay protected on the south 2.0
Pacasmayo, bay with little protection 4.6	Independencia Bay, bay largely shut in from ocean..... 1.0
Lobos de Afuera, bay between islands 30 miles off shore... 3.4 to 3.0	Mollendo, on very exposed shore 0.0
	Lobos de Tierra, islands 12 miles off shore..... 0.5 to 1.0
	Chincha Islands, islands 10 miles off shore..... 1.5
<i>Intermediate Degree of Local Variation</i>	
Callao, bay partially protected.....	2.5° C.
Guañape Islands, islands about 10 miles off shore.....	2.5° C.

These data are puzzling only at first glance. We find the maximum local variation where eddies are to be inferred: Paita Bay, Chimbote Bay, Pacasmayo Bay, Lobos de Afuera Bay. We find minimum local variation where the stations are exposed: Mollendo, Chincha Islands, Lobos de Tierra. (It is to be remarked that at both the Chincha and Lobos de Tierra Islands the temperatures were taken on the inshore sides, not protected from a

⁸ The northern current has also attracted a certain amount of scientific notice. Following the observations of Lartigue, 1822, Ray, Fitz Roy, Findlay, and others have remarked on its peculiarities. In 1891 the extraordinary rains of the north Peruvian coast were associated with an intense development of the current. Interest awakened by the occurrence took shape in papers contributed to the *Bol. Soc. Geogr. de Lima* (Luis Carranza: *Contra-corriente marítima, observada en Paita y Pacasmayo*, Vol. 1, 1892 pp. 344-345; Camilo N. Carrillo: *Hidrografía oceánica*, Vol. 2, 1893, pp. 72-110; F. A. Pezet: *La contra corriente "El Niño" en la costa norte del Perú*, Vol. 5, 1896, pp. 457-461.

north or south current but protected from any movement with a tendency east or west.) We also find little variation in Independencia Bay, but the openings are at the northern and southern extremities of a long bay. Callao Bay, being open to the current on the south, is less liable to an eddy; the same cannot be said of Pisco Bay, but the shore current there passing through the straits between Paracas Peninsula and San Gallan Island may affect the mainland shore as far as the port of Pisco, though there is an undoubted eddy in the southern extremity of the bay. Guañape alone offers a somewhat greater degree of variation than we should expect by comparison with Lobos de Tierra below and the Chincha Islands above.

It is inconceivable that the surface temperature could remain so little affected while the current traverses so great a distance, except there occur an intermingling of waters from below; yet, if any inference can be drawn from the observations here offered, it must be that the vertical movements are not localized but are generally distributed and perhaps continuous. The exact nature and the vertical extent of the movements certainly await further investigation.

Data bearing on seasonal variations are expressed in the following tables, giving the difference between averages taken at given localities in different seasons of the year:

Table of Seasonal Variations

Lobos de Tierra, April, Dec.....	1.7° C. (see below)
Lobos de Afuera, March, Nov.....	2.3 “ “
Callao, various months.....	1.6 “ “
Chincha Islands, June 1907, July 1908.....	1.3 “ “
Lobos de Tierra, March, April 1907, average of 20 readings.....	20.5° C.
“ “ Dec. 1907, “ “ 4 “ 	18.8
Difference	1.7° C.
Lobos de Afuera, March 1907, average of 31 readings..	20.5° C.
“ “ Nov. 1907, “ “ 12 “ 	18.2
Difference	2.3° C.
Callao, Jan. 1907, average of 10 readings.....	16.5° C.
Oct. “ 9 	16
Nov. “ 6 	16.7
April 1908, 15 	17.6
May “ 24 	17.4
June “ 26 	17.3
July “ 4 	17.4
Difference at Callao between lowest monthly average (16°) and highest average (17.6°).....	1.6° C.
Isolated records are not included.	
Chincha Islands, June 1907, average of 11 readings.....	16.1° C.
“ “ July 1908, “ “ 6 “ 	17.4
Difference	1.3° C.

The data bearing on local variations, some of which have already been given, grouped into maximum and minimum values, are here cited more fully in geographical order. The following table expresses the difference between extreme temperatures taken at a given locality in one season. Such variations are much more pronounced than the difference of averages at different seasons. It is to be remembered, however, that these variations cannot be attributed to the condition of the weather nor, ordinarily, to the time of day when the record was made.

Table of Local Variations (In Geographical Order)

LATITUDE	PLACE	MONTH		READINGS	VARIATION
5°	Paita	April	1907	15	5.0° C.
6½°	Lobos de Tierra	April	"	20	0.5°
	Lobos de Tierra	Dec.	"	4	1.0°
7°	Lobos de Afuera	March	"	31	3.4°
	Lobos de Afuera	Nov.-Dec.	"	12	3.0°
7½°	Pacasmayo	March	"	14	4.6°
8½°	Guañape Islands	March	"	10	2.5°
9°	Ferrol (Chimbote)	March	"	12	4.5°
12°	Callao	April	1908	15	2.5°
	Callao	June	"	26	2.0°
13¾°	Pisco	June	1907	11	2.0°
13¾°	Chincha Islands	June	"	11	1.5°
	Chincha Islands	July	1908	6	1.5°
13¾°	Ballestas Islands	May-June	1908	11	3.0°
14¼°	Independencia Bay	June	"	8	1.0°
17°	Mollendo	July	1908	4	0.0°

Generally, as may be seen, the amount of variation (changes of temperature of the water in a given locality, without change of season) is greater in the regions of lower latitudes than in those of higher latitudes.

SOME CHINESE CONTRIBUTIONS TO METEOROLOGY

By CO-CHING CHU

Before the introduction of the western sciences, meteorology in China never advanced beyond the stage of prognostication by proverbs. Although meteorological instruments had been invented (some of them preceded the western discoveries by several centuries), yet they were never made use of on a large scale, and were looked upon rather as curiosities than as instruments to be utilized for human benefit.

WEATHER PROVERBS

Weather proverbs are numerous in China, and examples may be found in the classics as well as in modern folklore. As these proverbs are based mostly on observation and experience, it is not surprising that some of them should coincide with those of the West. Thus in *Tsu-Tsz*, a blank verse poem, written about 200-300 B. C., we have the saying, "Stay at home when the morning sky appears red, but look for a good day's travel when the evening clouds turn crimson."¹ Lao-Tze (604-?), the author of *Tao-Teh-King*,² said that heavy showers never last the whole morning, sharp thunders never last the whole day. Movement of the clouds as a prognostication of weather did not escape the notice of the early Chinese. In the writings of a scholar in the Han Dynasty, we find the saying that when clouds are going east traveling will be good, but when clouds are going west horses and carriages will be soiled. The occurrence of haloes was also believed by the Chinese to be the forerunner of a storm.

METEOROLOGICAL INSTRUMENTS

Although the use of the kite as a meteorological instrument to explore the upper air is of recent origin, yet, as a weapon of warfare, the kite was known to the Chinese at a very early date. Professor Rotch mentions³ that two hundred years after the alleged invention of a wooden dove by Archytas of Tarentum (i. e. about 200 B. C.), a Chinese general, Han Sin, employed kites as a means of communication with a garrison of a besieged town. As a matter of fact the use of kites for military operations was known in China even before the days of Archytas. In the writings of Moti,⁴ one of Confucius' most formidable rivals, who flourished between 500 and 400 B. C., mention was made.⁵ of a noted genius, Kung-Shu Pan, who spent three

¹ *Chinese Meteorol. and Astron. Mag.*, Vol. 2, 1916, p. 57, Peking. [In Chinese.]

² This book has been translated into several European languages. Possibly the best known English translation is that of Dr. Paul Carus (Chicago, 1898).

³ A. L. Rotch: *Sounding the Ocean of Air*, New York, 1900, p. 117.

⁴ See J. W. Bashford: *China: An Interpretation*, New York, 1916, p. 186. The *Encyclopædia Britannica* (11th ed., Vol. 6, p. 226) puts Moti in the period 500-400 B. C. Professor Giles was apparently in error when he named Moti as a philosopher in the period 300-200 B. C. in his "Confucius and His Rivals."

⁵ End of Book 13.

ears in constructing a bird of wood and bamboo, which when finished flew in the air for three days and three nights without apparent tendency to fall. Kung-Shu Pan constructed the bird as a device to attack the capital of Sung, one of the federal states at that time, in the interest of another state, Tsou.

Another instrument connected with meteorology and known to the early Chinese is the seismometer. Chang Hun (78-139 A. D.), who invented it, was well known in the later Han Dynasty for his literary works. His odes to Peking and Loyang were particularly celebrated. It is said that he spent ten years in writing the odes and that when they were finished the price of paper went up by leaps and bounds, showing how popular his work must have been. He seems to have been a versatile person, as he also invented several astronomical instruments and wrote an astronomical essay, Ling-Hsien, in which he expounded his theory of creation. He also calculated the value of π to be the square root of ten.⁶ The seismometer was known as "waiting wind seismometer": the significance of the term "waiting wind" is not clear. This instrument has been described and illustrated by John Milne.⁷

In Chinese history we sometimes find references to wind vanes and rain gages. We have, however, to go to Korean writings in order definitely to establish the fact that rain gages were installed for the purpose of collecting rainfall data as early as 1442 A. D.,⁸ two hundred years before Galileo's friend Benedetto Castelli introduced the use of the rain gage in the West. Dr. Wada, Director of the Korean Meteorological Service, acknowledged that the astronomical instruments of Korea were either imported from China or copied from Chinese models, but he believed that the rain gage is distinctly of Korean origin.

MAGNETIC NEEDLE

During the International Meteorological Congress held at Chicago in 1893, Bertelli, an Italian meteorologist, asserted⁹ that Christopher Columbus discovered the declination of the magnetic needle during his first transatlantic voyage. Evidences, however, tend to show that the Chinese had observed the fact of magnetic declination fully seven hundred years before Columbus. Alexander Wylie, a well-known sinologue, in his essay on the magnetic compass in China,¹⁰ says:

The priority of the Chinese in the use of the magnetic compass is now so generally acknowledged that any argument adduced to prove or illustrate it would be altogether

⁶ *Abhandl. zur Geschichte der Math. Wiss. mit Einschluss ihrer Anwendungen, begründet von Moritz Cantor*, No. 30, p. 47, Leipzig, 1912.

⁷ John Milne: *Earthquakes and Other Earth Movements*, London, 1886, p. 14. Milne apparently translated the passage from a Japanese book, and hence the discrepancy in the spelling of the name of the author.

⁸ A. G. McAdie: *The Principles of Aerography*, Chicago, 1917, p. 207; *Japanese Meteorol. Mag.*, 1910, p. 81-85; *Quart. Journ. Royal Meteorol. Soc.*, Vol. 37, 1911, pp. 83-86.

⁹ Timotheus Bertelli: *The Discovery of Magnetic Declination Made by Christopher Columbus*, in *Report of the International Meteorological Congress, Held at Chicago, Ill., Aug. 21-24, 1893*, *Weather Bur. Bull. No. 11*, Washington, D. C., 1894-96, pp. 486-492.

¹⁰ Alexander Wylie: *Chinese Researches*, Shanghai, 1897, p. 155.

superfluous; the fact that the declination of the magnetic needle was already known to them at an early date is now well understood. In *Lih Seang Kaou Chin*, which appeared at the end of the seventeenth century (Bk. 4, p. 2), it says, "The magnetic needle cannot be taken as a standard, for it is found to have a declination."

A passage from the life of Yih Hing, a Buddhist priest and imperial astronomer at the commencement of the eighth century, will show that the subject engaged the attention at least 900 years earlier. It is said "On comparing the needle with the north pole I found the former pointed between the constellations of Heu and Wei.¹¹ The pole was just six degrees from Heu, from which the needle declines to the right (east) $2^{\circ} 95'$." Thus at the beginning of the eighth century the variation of the needle at Singan (capital of China at that time) was $2^{\circ} 95'$.¹³

SUN SPOTS

Although the relation between sun spots and weather was not suspected by the Chinese, yet, as pointed out by Hosie,¹⁴ it is generally admitted that the Chinese were the first to discover the sun spots. The famous French astronomer and meteorologist Arago says:¹⁵

Dans les annales de la Chine du père Mailla, on lit qu'en l'an 321 de notre ère, il avait sur le soleil des taches qui s'apercevaient à la simple vue. En prenant à la lettre les assertions du père Mailla les titres des Chinois seraient de meilleur aloi.

THERMOMETERS AND HYGROSCOPES

Thermometers and hygrometers were first introduced into China in the middle of the seventeenth century by Ferdinand Verbiest¹⁶ (1623-1688), a disciple of Tycho Brahe (1546-1601). Verbiest entered China in the year 1659. From that year until his death he received numerous favors and honors from the Emperor Kan-Si. For several years he held the post of President of the Board of Mathematics and Astronomy.

The thermometer and the hygrometer, claimed by Verbiest as his own inventions, appear so novel and so different from the early instruments of the West, that it is not out of place to describe them here. In principle Verbiest's thermometer¹⁷ resembles the air thermometer of Galileo and shares the defect of the latter in that it is also affected by the varying atmospheric pressure. As shown in the figure (Fig. 1) the instrument consists of a U-tube made of glass fitted into a wooden frame. One end of the tube is connected with a large bulb filled with air while the other end

¹¹ The constellation Heu commences in Aquarius $19^{\circ} 13' 17''$, and Wei in Aquarius $29^{\circ} 11' 13''$.

¹² In the old Chinese reckoning, a degree is divided into 100 minutes, and a minute into 100 seconds.

¹³ Timotheus Bertelli: *La declinazione magnetica e la sua variazione nello spazio scoperte da Cristoforo Colombo*, Rome, 1892. He quotes many Chinese passages in French translation to prove that the early Chinese had really no knowledge of the magnetic declination. Apparently Bertelli was not aware of Yih-Hing's work.

¹⁴ Alexander Hosie: *Sunspots and Sun-Shadows Observed in China*, B. C. 28-A. D. 1617, *Journ. North China Branch Royal Asiatic Soc.*, N. S., Vol. 12, Shanghai, 1878, pp. 91-95.

¹⁵ D. F. J. Arago: *Astronomie populaire*, Vol. 2, pp. 107-108, Paris, 1858.

¹⁶ For further reference to Father Verbiest, see J. B. DuHalde: *The General History of China*, 4 vols. London, 1736 (translated from the French); reference in Vol. 3, pp. 86-110.

¹⁷ Illustrations and descriptions of these two instruments appear in the Chinese Encyclopedia (*Kua-Chiang-Tu-Shu Chi-Zung*), a work instigated by the emperor Kan-Si (1662-1722) and published during the reign of his successor. A printed edition in 1628 volumes of about 200 pages each was issued at Shanghai in 1889. The illustration of the thermometer is reproduced below (Fig. 1).

open, water being used to fill the lower portion of the tube. A scale is attached to each arm of the tube, graduated in ten degrees at unequal intervals which vary with the rate of expansion and contraction of the air. As explained by Verbiest, the instrument can be used to measure the atmospheric and ground temperatures, the temperature of the human body, and even the temperature of planets, moon, and stars. He seriously entertained the idea that if the thermometer were exposed to moonlight the gas in the bulb would be seen to contract, showing the low lunar temperature. He also stated that the physical vitality of persons could be tested by their merely rubbing the bulb for a minute or two.

In common with the other hygrosopes of early times, Verbiest's instrument consists of the gut of an animal (a deer in this case), which expands and contracts as the moisture content of air increases or decreases. The deer gut in question is two Chinese feet¹⁸ in length and one-tenth of an inch in thickness. It hangs in a wooden frame open on all sides. At the lower

end of the gut a suitable weight is attached. A little above this an indicator in the form of a needle, decorated with dragons, is inserted in the gut with a scale just beneath it. When the moisture content of the air increases the indicator turns to the left, when it decreases the indicator turns to the right. The relative humidity of the atmosphere is thus roughly indicated.

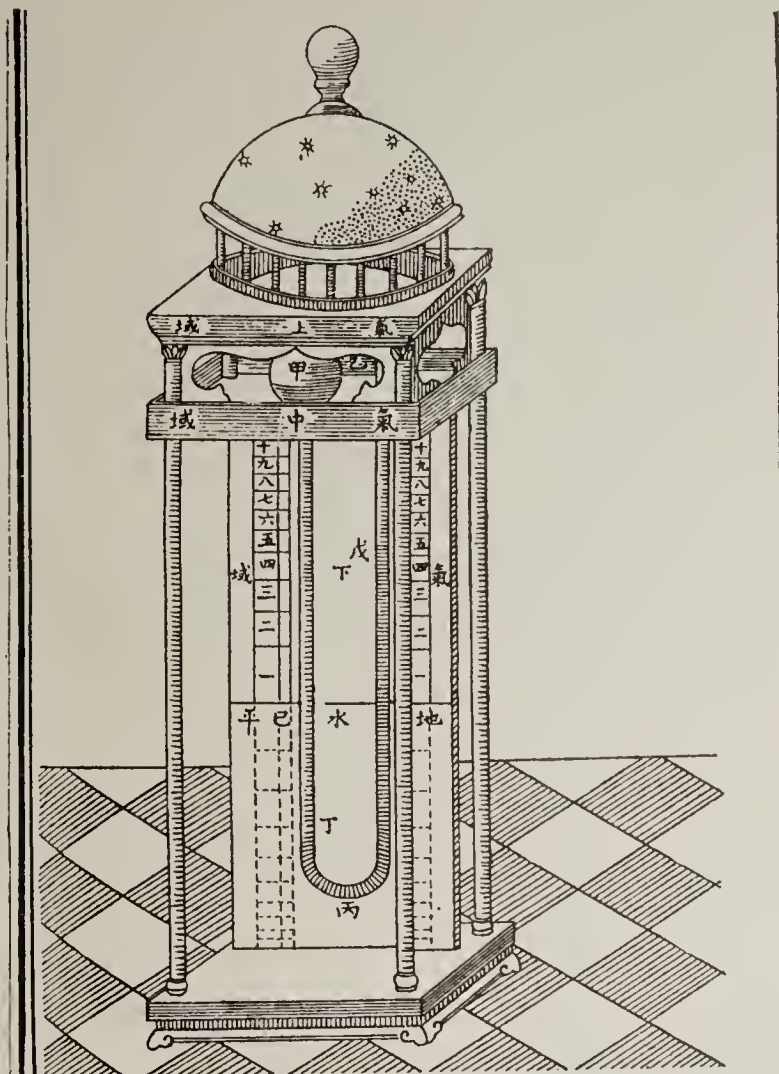


FIG. 1—Ferdinand Verbiest's thermometer of the second half of the seventeenth century. (Reproduced from Fig. 103 of the Chinese Encyclopedia.)

The two columns of figures on the scale are the Chinese numerals from 1 to 10, reading upward. The region below zero is supposed to represent the condition beneath the earth's crust, which, according to Verbiest, is extremely cold. The crown of the instrument with stars engraved on it is supposed to represent the condition in interstellar space, which is thought to be also very cold. The other Chinese characters are used to designate different parts of the instrument.

¹⁸ One Chinese foot = 1.05 English feet.

NEW EVIDENCE THAT COOK DID NOT REACH THE POLE

In the course of the Crocker Land Expedition, organized under the joint auspices of the American Museum of Natural History, the American Geographical Society, and the University of Illinois, whose recent return was referred to in these pages (October, 1917, *Review*, pp. 320-321), the service were secured of two Eskimos, E-took-a-shoo and Ah-pellah, who were with Dr. Frederick A. Cook on his expedition of 1907-09 and accompanied him on his alleged journey to the North Pole. Mr. Donald B. MacMillan, the leader of the expedition, took the opportunity to question them in detail regarding Dr. Cook's trip. The reliability of their report rests upon the remarkable development of the sense of location which is a characteristic of their race. This finds expression in their ability to reproduce with great fidelity the details of a journey and in their skill in reading and constructing maps. Numerous examples of Eskimo maps are known, notably those of Cumberland Sound and Frobisher Bay in the southeastern part of Baffin Island (Boas' "The Central Eskimo," *Sixth Annual Rept. Bur. of Amer. Ethnol. for 1884-85*) and of the central part of the eastern coast of Greenland (Holm's "East Greenland Expedition of 1883-85," *Meddelelser om Grönland*, Vols. 9-10). This report to Mr. MacMillan on Dr. Cook's journey is therefore not in the nature of loose testimony but a real contribution to the subject. The detailed evidence is embodied in a letter from Mr. MacMillan to the editor of the *Geographical Review*. The letter follows:

Boston, Mass., December 31, 1917.

To the Editor of the Geographical Review:

Dr. Cook with a single white companion, by the name of Francke, the cook of the fishing schooner *John R. Bradley*, was landed at Annoatok, some fifteen miles north of Etah, late in August, 1907. There were living here at this time about six families of the so-called Smith Sound tribe of Eskimos. This number was supplemented later by the arrival of several families from the south.

"Shortly after the sun returned" in February, the expedition left Annoatok, aiming west across Smith Sound for the head of Flagler Bay. Ascending the river valley Dr. Cook crossed over the heights of Ellesmere Island into Bay Fiord and on up Eureka Sound to the northern end of Axel Heiberg Island but did not reach Cape Thomas Hubbard, which is some five miles west, this accounting for his not finding Peary's cairn and record. Game was plentiful throughout the trip; the dogs and the men were well fed.

At this point a cache of food and a few small articles were left. Four Eskimos returned to Etah. Four Eskimos accompanied Dr. Cook during the first day's march on the Polar Sea, a march of about twelve miles. Upon the completion of the snow home, two Eskimos returned to land, leaving E-took-a-shoo and Ah-pellah ["E-tuk-i-shook" and "Ah-we-lah" in Dr. Cook's book] alone with Dr. Cook.

Dr. Cook and his two Eskimo boys did not proceed beyond this point, which is about 500 miles from the Pole. A flag was raised over the snow house and a picture taken.

r instruments Dr. Cook had with him a common watch, a compass, and a full sextant. e sledges were loaded with food.

After sleeping at this camp two nights, the party returned to the cache on the shores Axel Heiberg Island, took everything from the cache, and proceeded south, following western shore. Two low islands were discovered in about latitude 79°, very low and out five miles from land. The party crossed to the eastern shore of Amund Ringnes land, where camp was made and one or two caribou were killed. Returning, they made mp a little east of Cape Southwest of Axel Heiberg Island. They now journeyed uttheast to the shores of North Lincoln [southern part of Ellesmere Island], crossing e land into Gaase Fiord. Upon reaching the entrance they turned west, then north to the narrow channel known as Hell Gate. Here the small canvas boat was launched, e of the two sledges placed on board, and all dogs abandoned. The boat proceeded uth, then east, following the southern shore of Jones Sound to Baffin Bay. Encounter- g heavy ice which barred their progress south, they returned west and landed at Cape arbo on the northern shore of North Devon. Here an old Eskimo igloo was prepared d furnished for the winter to come. Game was plentiful, and the igloo, well stocked th meat, was warm and comfortable.

Early in the spring of 1909 these three men packed their sledge and began their long alk back to Etah, the two Eskimo boys generally pulling the sledge and Dr. Cook shing on the upstanders.

Between Cobourg Island and North Lincoln two uncharted islands were discovered. a the retreat northward the party followed a course well away from land, because of e depth of snow prevalent here in the spring of the year. Food gave out. All became ry tired and very hungry. Finally a bear was secured, enabling the men to reach pe Sabine. Here a seal was found in cache, placed there one year before by Panik-pa, e father of E-took-a-shoo. With renewed strength, thus acquired, the party succeeded crossing Smith Sound to the headquarters of Dr. Cook at Annoatok. Following a few ys' rest Dr. Cook proceeded south by dog team to Upernivik.

Many of the photographs in Dr. Cook's "My Attainment of the Pole," New York, 1911, are recognized by both E-took-a-shoo and Ah-pellah. The photographs facing age 244 marked "Bradley Land Discovered," etc., were taken off the western shore of Axel Heiberg Island, about 550 miles from the Pole.

Facing page 282: Photo "Mending Near the Pole" was taken on west side of Axel eiberg Island.

Facing page 286: "At the Pole—'We were the only pulsating creatures in a dead orld of ice.'" Photos taken in spring of 1909 near Cape Faraday on east coast of llesmere Island about 780 miles from the Pole. The musk-ox boots worn by Ah-pellah ere made in the igloo at Cape Sparbo in Jones Sound, following Cook's return from e north.

Facing page 298: "First Camp at the Pole, April 21, 1908." Photo taken in spring e 1909 a little south of Cape Faraday on the eastern shores of Ellesmere Island.

Facing page 310: "With eager eyes we searched the dusky plains of crystal, but ere was no land, no life, to relieve the purple run of death." Photo taken near Cape araday. Ah-pellah is wearing a musk-ox coat made at Cape Sparbo in Jones Sound.

Facing page 332: "Back to Land and Life." Taken near Cape Southwest, southern east of Axel Heiberg Island.

Facing page 336: "Saved from starvation, the result of one of our last cartridges."aken near Cape Svarten on the north shore of North Devon. The boys had many artridges at this time. They had four, in fact, when they reached Etah.

Very truly yours,

DONALD B. MACMILLAN
Leader, Crocker Land Expedition

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Annual Reports of the Society; Meetings of January. The annual meeting of the American Geographical Society was held on Tuesday evening, January 22, at the Engineering Societies' Building, 29 West Thirty-ninth Street. The annual reports of the Council, of the Treasurer, and of the Special Committee were read, as follows:

REPORT OF THE COUNCIL

January 17, 1918.

To the Fellows of the American Geographical Society:

The activities of the Society during the past year are an indication of the progress made by it in the realization of its ideal of public service. In outlining these activities the following divisions may be considered: (1) special work in connection with the war, (2) Department of Exploration and Research, (3) the *Geographical Review*, (4) special publications, (5) lectures, and (6) library.

The first thought of every one has been in some connection with the Great War, and our organization has been no exception to the rule. It has been our good fortune to be able to be of material service by rendering available to the military forces of the country our collection of topographical and other maps, so that some fifteen hundred of them were used by the United States forces at their advent in France. We have also been employed by the Government to do some extended work which we are led to believe has been of much utility.

Communications abroad have been much interrupted but, nevertheless, we have maintained our exchanges with nearly four hundred foreign correspondents, so necessary to our program of affording the broadest possible field of information in the *Review*.

The most important single advance in the development of the Society has been the foundation of a Department of Exploration and Research. This work, which the Council have long aspired to attempt, has been rendered possible by the generosity of a valued Councilor. Funds have been secured for a broad program of work in 1918, to be described in detail in an early number of the *Review*. With the establishment of a definite program of research the Society has now an organization which will enable it to exercise the functions of a geographical institute, as the term is employed abroad.

The *Geographical Review*, which is the principal medium of the Society in communicating with its Fellows and with the outside world, has been maintained at a high level, and we have received many compliments upon our success in making the publication a judicious combination of scientific and popular geography. We have been able to present a large number of maps, prepared by our own staff, whenever essential to explain the text of any article, and we have had recourse somewhat more freely to half-tone illustrations in connection with the printed matter.

The second of a series of monographs, issued to members desiring it, was entitled "The Frontiers of Language and Nationality in Europe," by Leon Dominian, and the work appeared at an opportune time, as evidenced by the fact that it has been extensively quoted and referred to by writers upon the burning topics arising out of the European conflict. During the current year the Society expects to issue a striking book, exceptionally well illustrated, which will deal with the relation of physical geography to military strategy on the European battle fronts. There has also been prepared by a special emissary of the Society, sent to Petrograd for the purpose, a translation and review of the diaries kept by the mariner Bering during his Northwest voyages. This original matter will, it is thought, prove of interest.

The semi-monthly lectures, delivered in this city during the winter, were carefully selected and were largely attended by our local membership. Addresses were delivered by the following lecturers: Eric Mjöberg, William Curtis Farabee, B. R. Baumgardt, Arthur L. Day, J. Russell Smith, Theodore Roosevelt, George W. Goethals, LeRoy Jeffers, Donald B. MacMillan, and Theodoor de Booy.

Additions to the Library comprise 1283 books, 525 pamphlets, 828 periodicals, 36 atlases, and 1628 maps. Much progress has been made in continuing the binding of

abound publications, rendering them much more convenient for reference. It is hoped that the ensuing year will witness the substantial completion of this labor.

At the official celebration of the opening of the Croton Aqueduct the Society was invited to participate and prepared an interesting exhibit of maps and historical material bearing upon the subject.

The number of Fellows at the date of this report is 3,586, of whom 381 are Life Fellows. The increase during the year numbers 799.

Four gold medals of the Society have been awarded, as follows:

The David Livingstone Centenary Medal to Theodore Roosevelt in recognition of his original work as an explorer in Brazil.

The Cullum Geographical Medal to Major-General George W. Goethals for his distinguished service to the nation and to the commercial world in connection with the construction of the Panama Canal.

The Charles P. Daly Medal to Professor George G. Chisholm for his contributions in creating a world-wide interest in the geographical basis of commerce.

The David Livingstone Medal to Manuel Vicente Ballivian, who, by the broad scholarship displayed in his own researches, by his efforts to secure government aid for geographical work, and by his encouragement of explorers, has done much for the promotion of geographical knowledge in Bolivia.

The *Annals of the Association of American Geographers*, published through this Society as heretofore, have been accepted as a valuable contribution to science and to teachers and students of geography.

The building of the Society has been open every day of the year with the exception of holidays for the accommodation of the public and for the exhibition of maps and other publications of interest in connection with passing events. The visitors who availed themselves of the opportunity to inspect or study the collections numbered 33,006.

The financial situation of the Society is excellent, as shown by the report of the Treasurer, of which a summary is annexed hereto, showing current revenues and expenditures. Generous gifts have been received from friends for special purposes, either in the conduct of specific undertakings or for the acquisition of designated properties. This general acknowledgment is all that is allowed by the generous donors.

The members of the staff have shown a most commendable spirit in meeting certain calls upon them arising out of the conditions heretofore alluded to. Their zeal and efficiency have been much appreciated.

Respectfully submitted on behalf of the Council

John Greenough
Chairman

REPORT OF THE TREASURER FOR 1917

The following is a statement of the income account and the condensed balance sheet of the Society as shown by the books on December 31, 1917:

Income Account

During the year there has been received for annual dues, interest on investments, and sales of publications.....	\$55,819.61
There has been expended for salaries, house expenses, library, meetings, publications, postage, insurance, etc.....	50,586.29
Carried to Balance Sheet.....	\$5,233.32

Condensed Balance Sheet

Cash	\$26,224.78	Capital uninvested	\$3,691.22
Temporary investments.....	25,194.44	Sundry deposits	39,213.01
Sundry debits	63.33	Annual dues paid in advance	3,345.00
		Balance of income account...	5,233.32
	<u>\$51,482.55</u>		<u>\$51,482.55</u>

Henry Parish
Treasurer

REPORT OF THE SPECIAL COMMITTEE

The Special Committee appointed December 20, 1917, to nominate and invite suitable persons to fill vacancies which will occur in the offices of the Society at the date of its

annual meeting in January, 1918, respectfully report that they recommend the election of the following gentlemen to the offices designated:

		TERM TO EXPIRE IN
President	John Greenough.....	1919
Vice-President	Anton A. Raven.....	1921
Foreign Corresponding Secretary.....	William Libbey.....	1921
Treasurer	Henry Parish.....	1919
Councilors	Banyer Clarkson.....	1921
	Edwin Swift Balch.....	1921
	W. Redmond Cross.....	1921
	Walter B. James, M.D.....	1921
	H. Stuart Hotchkiss.....	1921
Hamilton Fish Kean	} Committee	
James B. Ford		
Allison V. Armour		

The reports of the Council and the Treasurer were approved and ordered on file. The persons recommended by the Special Committee for the offices to be filled received the unanimous vote of the Society and were declared duly elected.

President Greenough thereupon submitted for confirmation the names of 20 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society.

The lecture for the evening was entitled "Results of Several Journeys of Exploration in the Northwestern Amazon Basin," by Dr. Hamilton Rice. Dr. Rice took his hearers on an imaginary journey across the South American continent from Bogotá to the mouth of the Amazon, drawing mainly on the observations of his 1911-13 and 1916-17 trips. He described in detail his surveys of the Inirida, Içana, and Uaupés Rivers—surveys which have cleared up so much of the large unknown tract in the northwestern quadrant of the Amazon Basin. Dr. Rice briefly explained the methods used in making a reconnaissance survey such as he had undertaken, illustrating his words by lantern slides showing pages from his field notes, the taking of observations for latitude and longitude with a transit-theodolite, etc. The use of wireless telegraphy on his latest expedition, when communication with Arlington, Va., was easily maintained, was dwelt upon and the general use of this method in future exploratory work for the determination of longitudes predicted.

At an extra inter-monthly meeting on January 8 Mr. Henry Charles Woods, late British Vice-Consul at Adana, Asia Minor, addressed the Society on "The Bagdad Railway in the War." After outlining the course and present state of completion of the Bagdad Railway and its branches (see the maps in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, facing p. 936, and *Geogr. Rev.*, Vol. 1, 1916, facing p. 288) Mr. Woods described its strategic importance in the present war. The resistance of the Turks on the Mesopotamian and Palestine fronts, as well as their frustrated attack on the Suez Canal, were mainly made possible by the facilities for the movement of troops and supplies afforded by this artery. Since the recent opening of the Taurus and Amanus tunnels there is continuous rail connection between Constantinople and Nesibin, at least. The isolated section of the railroad from Bagdad to Samara, a distance of 75 miles, is now in British hands.

NORTH AMERICA

The Catskill Water System and the History of New York City's Water Supply. In the annals of hydraulic engineering the construction of New York City's new water-works must surely rank as an epic undertaking. From Ashokan, the beautiful man-made lake in the Catskills, water is brought 120 miles to Staten Island, a journey taking almost three days. From a height of 500 feet on leaving the lake the water descends at the Storm King crossing of the Hudson to 1,100 feet below sea level; in its journey through the city it passes 18 miles through a tunnel cut in solid rock, the longest tunnel in the world, and on the final stage to the Staten Island reservoir the water is carried under the Narrows of the harbor. The formal opening of this great system in the fall of 1917 marked an event to which New York and its leading institutions justly paid tribute. To the commemoration the American Geographical Society contributed by the compilation of a "Selected List of Books and Maps Relating to the Water Supply of New York City" (pamphlet of 8 pp.). Among the permanent contributions of other bodies may be noted "The Water Supply of New York City: A Brief History of Its Development from the Earliest Days to the Present Time" (Appendix C, pp. 487-566, *22nd Annual Rept. Amer. Scenic and Historic Preservation Soc.*, 1917, Albany, 1917). This historical summary outlines the water supply problem that has always been before New York since the

ed arose for an artificial supply to supplement the natural resources of the abundant ponds, brooks, and springs.

The earliest artificial supply was provided by wells, but the structure of lower Manhattan Island is not favorable for such a source, the alluvial deposits overlying the rock bottom being readily permeated by the salty water of the Hudson and East Rivers. As the city grew and the need for prevention of fire increased, pumps, introduced in the first half of the eighteenth century, came into general use, and the water supply became a municipal affair. But the city began to outgrow the local resources. Serious epidemics of yellow fever and cholera during the later years of the eighteenth and the early nineteenth century emphasized the need for a revolution in the system of water supply. As early as 1798 the Bronx River was proposed as a source of supply, but the first effectual step towards the development of an exterior source may be dated at 1831, when the assertion was accepted that "the Croton River could be carried into the City of New York, and that without it a supply adequate to the present and future wants of the city could not be obtained." At this time the population of the city amounted to 200,000. Six years later work was commenced on the Croton Aqueduct, and by 1842 Croton water was being delivered. But in less than a decade the city population had advanced to over 400,000, and the storage capacity of the Croton system was insufficient to meet seasons of serious drought. The Central Park Reservoir was added, and, as the phenomenal growth of the city continued, other reservoirs followed. By 1893 the New Croton Aqueduct, with a capacity of 300,000,000 gallons per day, had commenced delivery to the population, now exceeding 1,500,000.

Extension of the Croton system continued, until by 1911 a stage had been reached beyond which further development was economically impossible. New York, now growing at the rate of about 175,000 persons a year, must look still farther afield for sources of supply. For physical reasons and reasons of state policy selection rested with the Catskills, a region of sparse population with a topography favoring heavy run-off and satisfying storage needs (cf. C. P. Berkey: *Geology of the New York City (Catskill) Aqueduct*, *New York State Museum Bull.* 146, Albany, 1911; *idem*: *The Catskill Water Supply for New York City*, *Journ. of Geogr.*, Vol. 10, 1911-12, pp. 231-237; and Thaddeus Merriman: *Rainfall and Run-off of the Catskill Mountain Region*, *Monthly Weather Rev.*, Vol. 35, 1907, pp. 109-118). In the Catskills watersheds aggregating over 900 square miles and affording a capacity estimated at 760,000,000 gallons per day have been required. At present only one section, the Esopus watershed, with its reservoir of Ashokan, has been developed. East of the Hudson and 30 miles north of the city (City Hall) has also been built a storage and emergency reservoir (Kensico). The magnitude of this part of the undertaking may be gaged from the fact that an army of 4,500 men was employed on the building of these two great reservoirs alone. Further development will be prosecuted as needs arise, and thus, for some few years at least, the water requirements of the city are assured.

Recent Growth of the Fur Trade in the United States. The fur trade of the United States is one of the country's businesses that have been greatly modified by the war. In pre-war years the trade was dependent in considerable measure upon Europe, both in manufacturing and sales: for dyeing and finishing upon the great fur industry of Leipzig; on London and to a less extent on the Russian fairs for the fur sales. In 1915 the first plant for dyeing and finishing the Alaskan seal skins was opened in St. Louis; it has been highly successful. In 1915 the same city held the first public auction of Government seal skins, since when regular auctions have been held there and in New York. The amount realized at the New York and St. Louis sales in October last was over \$5,000,000 (J. C. Austrian: *The United States as a Fur Market*, *Dun's Rev.: International Edit.*, Dec., 1917). While the import of foreign undressed and manufactured furs has remained greatly diminished (1916), the imports of dressed furs has practically recovered, but with a noteworthy change of origin (*Commerce Repts.*, Nov. 15, 1916, pp. 617-619). The loss occasioned by the removal of Germany from the fur market has been made up by increased imports from Great Britain, Canada, France, Australia, and Argentina. The gain by the two last-named is particularly interesting. From an insignificant figure in 1913 the Argentine import suddenly jumped to over \$1,000,000 out of a total of \$17,000,000. It is this market that is supplying the greater part of the present popular nutria fur. The import from Australia, also greatly increased, is composed in part of rabbit skins, a substitute for those heretofore coming from Germany, Belgium, and France.

Peat, An Unutilized Resource of Minnesota. A glance at the agricultural maps of Minnesota in the "Minnesota Number" of the *Journal of Geography* (Feb., 1916) suggests the differentiation of the state into two economic areas, an agriculturally de-

veloped south and west and an agriculturally undeveloped northeast, the area of the large-sized countries. The latter is the region of coniferous forest, and it is the forest alone that has provided the single vegetal resource exploited commercially, though it is not the only one in prospect. For northern Minnesota possesses an untouched heritage from the Ice Age—peat deposits, among the largest and deepest on the continent. The glacial topography, with its gently undulating belts of drift and its quondam lake flats, has provided an ideal surface for peat accumulation, to which the still considerable water surface adds favorably humid atmospheric conditions. It is estimated that over 5,000,000 acres in the state are covered with peat to a depth of at least five feet, the minimum workable depth (E. K. Soper: 'The Peat Deposits of Minnesota, *Econ. Geol.*, Sept., 1917) and the largest and best lie on the unproductive surface of the northeastern area. How to make these deposits commercially profitable is still an unsolved problem. Peat has been used most generally as a fuel, but its calorific value is low, inferior to that of lignite; and as a fuel it has only been used to advantage in regions where superior fuels are lacking, as in Scandinavia, or are undeveloped, as in Russia, where 4,000,000 tons of peat are produced annually (Louis Renié: *L'industrie de la tourbe, La Nature*, May 26, 1917). Though possibilities of a machine peat industry for domestic fuel are not wanting, a greater future would seem to lie in the utilization of peat for power production. Peat producer-gas plants have proved successful for such a purpose in Europe. Furthermore the process affords a valuable by-product, ammonium sulphate, esteemed as a fertilizer for its high content of nitrogen. In relation to this scheme the great iron-mining areas of northeastern Minnesota have an important bearing. Besides minor industrial uses there also exists the possibility of using large tracts of shallow peat land for agriculture, a purpose which, again, would be highly advantageous to the industrial sections of this part of the state.

SOUTH AMERICA

The Chilean-Argentine Boundary in Beagle Channel, Tierra del Fuego. Two diminutive islands, almost unknown to geographers, navigators, or traders, have brought up a new boundary discussion between Chile and Argentina. As the value of islands does not depend upon their area (witness Manhattan and Heligoland), the question of ownership may be important even in remote Tierra del Fuego. The dispute concerns the islands of Picton and New, situated near the entrance to Beagle Channel. By a treaty of 1881 the boundary was to follow the meridian of Cape Espiritu Santo until it reached Beagle Channel. From there it turned eastward along the Channel, the islands on the south being recognized as Chilean. In the following years maps of both countries assigned all the southern islands to Chile, but in 1891 Argentine explorers decided that Beagle Channel had been wrongly represented and that Moat Bay, the eastern of two channels into which it may be considered here to be divided by Picton Island and New Island, does not constitute its eastern entrance. This would leave the ownership of the islands uncertain. The matter really hinges on the question as to whether magnetic or astronomic north was meant by the discoverers of the Channel. Captains Fitz-Roy and King, who commanded the English expeditions of 1826-36, and Darwin, who accompanied the second expedition, state that the entrance to Beagle Channel lies *north of Lennox Island*, an island that lies athwart the western channel and subdivides it again into two branches (for relative locations see map in *Geogr. Rev.*, Vol. 3, 1917, p. 177). The magnetic declination then averaged 24° east in that region. Chart No. 2207 of the U. S. Hydrographic Office gives 16° 35' as the declination for 1915, with a yearly decrease of 5'. Hence the doubt as to the location of various points. Even the statement that Beagle Channel runs almost directly east and west and is about 120 miles long does not clear the matter entirely, since the western entrance is formed of two unequal arms.

The islands in question are inhabited only by a few Indians (see C. W. Furlong's description of the Fuegian tribes and their environment, *Geogr. Rev.*, Vol. 3, 1917, pp. 1-15 and 169-187). White settlements have been attempted at various times but without success. The natural resources are meager, consisting of a small amount of timber and some fair grazing land. It was upon the Tierra del Fuego coast near here that Allen Gardiner and his party of English missionaries starved to death in 1850. The chill winds of the Antarctic alternate with western storms, and 65 per cent of the days are cloudy (Walter G. Davis: *Climate of the Argentine Republic*, Argentine Meteorological Office, Buenos Aires, 1910). It is possible but not probable that the islands may come to have strategic importance.

The Argentine position has been presented in the "Derrotero del Canal de Beagle" published by the Sección Hidrográfica del Ministerio de Marina (Buenos Aires, 1901), in the "Memoria de los trabajos efectuados en el Canal Beagle, 1899-1900," by the same department (Buenos Aires, 1912), and in a series of editorials in *La Prensa* of Buenos

ires in January and February, 1915, by Dr. Estanislao S. Zeballos. Chile's claim is defended by J. Guillermo Guerra, professor of international law in the University of Chile ("La soberanía chilena en las islas al sur del Canal Beagle," Santiago, 1917). The three volumes "Narrative of the Surveying Voyages of His Majesty's Ships *Adventure* and *Beagle*" (London, 1839) prepared by King, Fitz-Roy, and Darwin give a full description of Beagle Channel and adjoining lands. The character of the islands New and Victon is described at length in "Tierra del Fuego" by W. Parker Snow (London, 1857). Colonel Holdich in his "Countries of the King's Award" (London, 1904) devotes a chapter to this region, painting some charming word pictures of the scenery. The maps printed in the two countries afford interesting comparisons. The mere fact that the dispute has arisen shows that the development of South America is drawing attention even to the most remote corners of the continent.

British Guiana as an Exporter of Rice. To the credit of British Guiana stands a rapid development in cereal production. At the close of the last century the colony, almost wholly dependent on its sugar industry, imported annually about 40,000,000 pounds of rice. Today, while sugar is still the mainstay of the colony—forming 70 per cent of the export—rice cultivation has attained a stage where the product figures as an economically important export: in 1916 over 29,000,000 tons were shipped from British Guiana to the West Indies and the neighboring French and Dutch colonies. There is much in favor of this development. The abandoned sugar plantations of the flat coast lands, empoldered and easily irrigated, provide the right physical conditions. The East Indian who forms so large an element of the population is a cultivator trained by generations of labor in the rice field, and the hand work which he cannot supply should be replaced by mechanical devices (*Suppl. to Commerce Repts. No. 44a*, Oct. 29, 1917, and *Dun's Rev.: Internatl. Edit.*, Nov. 1917, p. 56).

EUROPE

Friuli, the Eastern Gate of the North Italian Plain. The plain, at least the comparatively small plain, is a feature suggesting geographical uniformity, and it is surprising to hear of the distinction of the North Italian plain into no less than 27 anthropogeographic types (Arrigo Lorenzi: *Studi sui tipi antropogeografici della pianura padana*, *Riv. Geogr. Ital.*, Vol. 21, 1914, pp. 269-354, 402-450, 497-530, 576-604). Analyzing the bases of this diversity E. Bénévent finds the most powerful determinant to lie in the hydrologic conditions of the plain (*La plaine du Po: Étude de géographie humaine d'après le livre de M. Arrigo Lorenzi*, *Ree. des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, No. 2, 1916, Grenoble).

North of the Po these hydrologic conditions divide the plain into three well-marked belts. On the Alpine borders coarse deposits at the heads of the alluvial fans are distinguished by their porosity and consequent aridity, an aridity made yet more pronounced by the dry summers. The streams, moreover, cut across the fans in channels too deep-sunk to permit the use of their waters for irrigation. Towards the base of the alluvial fans the rain water, sucked up by the greedy gravels higher up, reappears as a line of springs, and the streams, here graded, also offer water for irrigation. Below this second most-favored zone is a belt suffering from excess of water; the streams are raising their beds on natural levees, and drainage is the chief consideration. By proper provision for irrigation or drainage the second and third zones are susceptible of improvement towards great productivity, but under primitive cultivation distinction between the three zones is not great. While political instability existed such essentially co-operative works as those of irrigation and drainage could not be undertaken, but when the revolution of the nineteenth century brought peace and established order rapid progress appeared in the second and third zones, varying in degree with details of hydrography and soil. Today there are wide differences where fifty years ago modes of life had much in common. It is a far cry from the Piedmont rice farms, whose vastness recalls the Brazilian *fazenda*, or the equally great establishments of the dyked lands in the Po delta, to the primitive communal cultivation of the dry Piedmont foothills or the barren *magredi* of Friuli.

Of all the provinces of the plain Friuli is perhaps the most interesting. Here the greatest diversity of factors comes into operation (see also Raoul Blanchard: *Le Front Italien*, *Revue de Paris*, Sept. 15, 1915). As the eastern portal of the North Italian plain Friuli has always been a province apart, a transition zone geographically, a frontier zone politically. The geographic change is not sharp. Differentiation indeed commences east of the Adige, where begins the amphitheater of wild Venetian Pre-Alps, giving source to a drainage system distinct from that of the Po basin. Here are no glacier-fed, lake-regulated streams, but a local system of irregular torrents. In Venetia proper the cal-

careous plateau intervening between the heights and the plain serves to some extent as a means of control, but beyond the Piave the rude mountains frown directly down on the lowland. Here, too, heavier spring and autumn rains combine with the more rapid run-off to heighten the torrential nature of the streams. The volume of the Tagliamento where it debouches on the plain has been known to increase in a day or two from 40 to 9,000 cubic meters. In their recent advance across the plain of Friuli the Austro-Germans were favored by comparatively light rains and a low state of the rivers. A characteristic sudden rise would at least have delayed the rapidity of their movement. In sympathy with this stream regimen the alluvial fans of western Friuli attain a great areal development and a maximum of porosity and aridity; in places water is not to be found at depths of 100 meters. The country is steppe; wide spaces provide only scant pasture; cultivation is found only near the villages aligned along the mountain torrents. Property here is still held communally. Farther east, around Udine and Gorizia, conditions ameliorate, the soil becomes less permeable and more fertile and rains more abundant. Villages are smaller—for water is better distributed—but much more numerous. With irrigation much might be done; as yet it is scarcely attempted: the region is in a frontier zone of insecurity. Everywhere frontier characteristics are exhibited, from the dialect bizarre with its words of Slav origin to the walled villages bespeaking the ancient fear of the invader. And if progress in the higher zones is retarded, still more so is it in the sea borders. About the Piave drainage has made rich lands available for cultivation—the lands now flooded for the defence of Venice, but between the Tagliamento and the Isonzo vast marshes bordering the lagoon remain in their primitive condition. They are desolate wastes, cutting off the hinterland from access to the sea. The backwardness of Friuli has an historical as well as a physical basis.

AFRICA

The Uganda Railroad in the Development of East Africa. During the years immediately following the partition of Africa (1884) our rapidly increasing knowledge of the central regions made patent the extent and influence of the slave trade, whose horrors had been first revealed by Livingstone. Need for the suppression of this shameful traffic led to the Brussels Conference (1890), wherein among the measures recommended was development by the interested Powers of means of communication, especially railroads in the respective territories. As a matter of national duty and political expediency Great Britain complied with the obligation of the conference by building the Uganda Railroad through her East African sphere of influence. The result might be described as magical: the line not only fulfilled the humanitarian and strategic expectations; it “literally created a country.” Today the Uganda line remains the dominant influence of British East Africa, and its economic sphere extends far over Uganda and over a part of German East Africa. As may be anticipated the annual *Administration Report of the Railways of East Africa and Uganda* is a document of great geographical interest, and this is particularly so in the case of the current report, for the year 1916-17 (Nairobi, 1917), wherein war conditions have tested out the merits of the line. Discounting the invaluable military services of the line in the German East African campaign and eliminating the figures of traffic accruing from this source, the prosperity of the line in wartime remains significant, as the following table shows (values given in round numbers in rupees):

Year	Up Traffic	Down Traffic
1910-11	1,790,000	770,000
1913-14	3,860,000	1,420,000
1914-15	2,470,000	1,000,000
1915-16	2,390,000	1,000,000
1916-17	2,940,000	1,380,000

During the three years of the war no traffic came from the German possession, which has normally accounted for about one-fifth of the total. Including revenues from military transport the net earnings of the Uganda line have steadily increased from the small credit of the second year of operation (1904-05) to a gain of about \$1,750,000 in 1916-17.

The prospects for future expansion are two-fold. Cotton and coffee cultivation, upon which the line is chiefly dependent, will expand and with their expansion the status of native civilization will also increase, swelling the import as well as the export trade. Another prospect lies in the progress of white colonization. The highlands of British East Africa constitute the most extensive area in equatorial Africa where the white man can look for a permanent home. The possibilities of the highlands have long been recognized or at least suspected. They have been the site of visionary colonization projects;

but definite proof of their suitability for white colonization also exists, as the Boer families established on the Uasin Gishu plateau east of Mt. Elgon attest. The latest project, recorded in *United Empire* for September, 1917 (H. R. Tate: British East Africa), aims at establishing on the land soldiers of European extraction who have served in the present war in East Africa or elsewhere. Success of such a scheme would appear, however, to be largely dependent on the facilitation of communication. Of especial importance, then, in this regard is the survey by the railroad administration for a line over the Uasin Gishu plateau. The proposed road will probably constitute a portion of a future trunk line to Uganda and the Congo and apparently would serve one of the three chief districts designated for the proposed colonization.

One other item of the report merits attention at this time when the future of colonial administration is in the balance. The native problem is the crux of the question. Its solution must be largely determined by the estimate of the native's capacity for civilization. Twenty years ago the native of British East Africa—as distinct from Uganda—was considered hopeless and useless. "Native labor is of little value, no dependence can be placed upon it, and even famine fails to force the tribes to seek work." Today that opinion has been changed to a belief that, trained and educated, the native can supply labor skilled as well as unskilled for all the manufacturing and industrial enterprises of the protectorate. The railroad provides an example of remarkable progress in industrial education in the 9,000 Africans working upon it.

A New Abyssinian Potash Deposit. The economic factor, especially in its aspect of mineral wealth, has been one of the most provocative factors in the precipitation of boundary disputes. The Alsace-Lorraine question has its economic side based on the iron deposits of the frontier-zone. The Chilo-Peruvian War of 1879-83 for possession of the nitrate fields is a notorious example. Even Central Africa, whose mineral resources are so little known, has been vexed by this question. Recognition of the value of the Katwe salt deposits on the Congo-Uganda boundary led to a reinvestigation of the original delimitation and a necessity for fixing the "wandering" meridian of 30° E. A later case is that arising from the discovery of that rare natural deposit, soluble salts of potash, in the undelimited frontier region between Eritrea and Abyssinia, some 50 miles inland from the hitherto insignificant Red Sea port of Fatimari (15° S. and 40¼° E.). The mineral, at first thought to be in Italian territory, is now for the time being conceded to lie in Abyssinia (*Commerce Repts.*, July 20, 1917). The discovery was made in 1911, but as the locality is a barren waterless district far from any established port, little interest was aroused. At that time the only deposits in course of commercial exploitation were those of Strassfurt and the newly opened mines of Mülhausen, the world monopoly thus being in the hands of Germany. When the war removed Germany from the potash market exploitation of the African deposit was hurriedly commenced. A good deal of potash has already been shipped on camel back to the coast and a railroad and port are in the course of construction.

The deposit differs from those of Alsace and Catalonia (still undeveloped), which are of Tertiary age, and that of Stassfurt, which is Permian, in that it is of recent formation. The product of evaporation from a former arm of the sea in a depression pertaining to the great rift system of East Africa (P. Sallior: Gisements de potasse nouveaux, *La Nature*, Nov. 24, 1917, summarized by T. E. Thorpe under "Sources of Potash," *Nature*, Jan. 3, 1918).

ASIA

The Punjab Irrigation System. The modification of the earth's surface and the turning to man's benefit of conditions naturally unfavorable is nowhere more marked than in irrigation development. The engineer, or literally "ingenious man," has before him the problem of co-operating with nature in a vast creative enterprise and in perfecting details which, from the human standpoint, have been left unfinished. It has been reserved for recent years and for modern ingenuity to bring to a high degree of development the distribution of water to dry lands which nature has been perfecting for thousands of years and human agencies for hundreds.

Perhaps the most notable instance in modern engineering of the utilization of geographical knowledge, including that of ancient times, is to be found in the Punjab region of India, the land known in the native tongue as the "Panj (five) ab (water or rivers)" (Sir John Benton: The Punjab Triple Canal System, *Minutes of Proc. of Inst. of Civil Engineers, London*, Vol. 201, Session 1915-16, Part I, 52 pp.; abstracted in *Engineering* (London), Nov. 19, 1915, p. 515). These five rivers flow southwesterly from the Himalayas and unite to form the mighty Indus. Before they join they flow through a rich

alluvial country which is capable of supporting in comfort a much larger population than now exists if only one missing necessity can be supplied, and that is water. Because of the difference in their catchment areas the rivers are dissimilar in size and in regularity of flow. The larger and more dependable streams are so located that their waters can not readily be diverted to the neighboring lands, while the smaller streams, more easily controlled by the engineer, have been overcapitalized, as it were, that is, gravity canals have been built from them commanding areas larger than can be supplied. To rectify this condition, the British engineers in India have made extensive studies of the topography of the irrigable areas and have finally built large supply canals which enable the transfer of water from west to east, from the rivers where there is an abundance to those where it is deficient.

On the east of the central Punjab is a tract of more than 1,500,000 acres of fertile land which has been lying idle for want of water and which can not be supplied from any source near it, because the perennial supply from the nearer streams, the Sutlej, Ravi, and Chenab, had already been fully utilized. At the same time only about a quarter of the perennial flow carried by the more western stream, the Jhelum, had been diverted, the remainder flowing useless to the sea. The suggestion was made that this surplus should be diverted to the east for the irrigation of the dry fertile land. To do so necessitated the crossing of two of the eastern rivers, namely, the Chenab and the Rabi, and also of numerous and formidable hill torrents.

The project of taking the excess water easterly has finally been carried out by the construction of three separate but interconnecting canals. The first, known as the Upper Jhelum Canal, with a capacity of 8,500 cubic feet per second, takes water from the river of that name, carrying it southerly across the divide to the Chenab River. From this stream there had already been built what is known as the Lower Chenab Canal, which took out most of the available supply. This canal is sufficiently far down on the river to receive the water brought over by the Upper Jhelum Canal. Above the Lower Chenab Canal is a vast extent of excellent land which could not be reached by the older works. Another canal, therefore, the Upper Chenab Canal, the second in the series above noted, was built, with capacity at the head of 11,700 second-feet, to utilize the natural flow of the Chenab River. In so doing it would deprive the older Lower Chenab Canal of needed water were it not for the supply brought into the Chenab River by the Upper Jhelum Canal, which brings in as much water as the new Upper Chenab Canal takes out above.

The quantity received by the Upper Chenab Canal is such as to permit a certain amount to be carried through the system and to escape into the Rabi River. At this point there is a dam or barrage across the channel, and the third important canal, known as the Lower Bari Doab Canal, takes off a volume of 6,750 cubic feet per second.

Thus, by this system of three canals it has been possible to divert waters across a rough country from the largest stream on the west and to increase the flow in a smaller river, from which water is taken at a higher elevation and in an equivalent amount, to be transported across another natural divide into the third stream, from which in turn another canal takes off. The total length of these canals and their branches and distributing systems to the farms is nearly 23,000 miles.

The average rainfall is from 25 inches near the mountains to 10 inches out on the lower plains. In dry years the precipitation is about one-half this amount. Irrigation is carried on throughout the year, this being divided into two seasons, the cold, from October to March, and the hot, from April to September, when the rivers are flooded and when nearly 90 per cent of the annual rainfall occurs. During this time what is known as the *karif* crop is obtained. The cold half of the year, embracing the winter months, produces what is known as the *rabi* crop. The duty of water, that is to say, the number of acres irrigated by one cubic foot of water per second, is during the hot season about 100 acres and during the cold months 200 acres.

The lands are divided on the basis of about 25 acres to a family, and the annual charge for water is from \$1.50 to \$1.75 per acre. Out of a total irrigable area of approximately 4,000,000 acres one-half is irrigated by this system. It has not been considered wise to attempt to water a larger proportion at present because of the fact that under existing conditions there is a deficiency of fertilizers, there being little if any manure in the country. With the native system of agriculture the only successful way of renewing the soil is by alternate periods of cultivation and fallowing. The danger of waterlogging the soil is also reduced by irrigating only a portion of the tract.

The total investment has been about \$30,000,000, and on this amount the completed works will return an interest of 8 per cent or over. In addition much financial benefit will accrue from increased returns to the railroads and other industries, so that the annual gains may be placed, possibly, at 15 per cent, in addition to the increased prosperity of the people who are transforming a drought-stricken famine country into one of the most highly productive portions of the earth.

F. H. NEWELL.

PHYSICAL GEOGRAPHY

Rainfall and Battles. The widespread popular notion that gunfire produces rain will not die. It has come very prominently to the front again since the war began. In spite of all that scientific writers have done and are doing to overthrow this belief, the superstition, or prejudice, still persists. Recently, M. Alfred Angot, Director of the Bureau Central Météorologique de France, has presented the facts in the case clearly and authoritatively (*Comptes Rendus de l'Acad. d'Agric.*, No. 18, 1917, 3, pp. 501-508). Mixture of warm and cold air masses, as the result of explosions, might cause cloud formation or even a slight drizzle but never any considerable precipitation. Water vapor resulting from chemical reaction could not be a source of precipitation. An enormous amount of explosives would be required to produce even a small rainfall, and even then all the hydrogen in the explosive would have to become water vapor and condense at once (21,750 tons of melinite per square mile, to give 1 millimeter). Electrical action, resulting from the ionization produced by high explosives, and an excessive number of dust particles arising from the same source can do "no more than accelerate a precipitation which would be necessitated sooner or later by the progressive cooling of the air." A careful study of the amounts and the frequency of rainfall in France since the war began fails to show any effects of the gunfiring.

R. DEC. WARD

Can Seasonal Weather Forecasts Be Made from Ocean Water Movements?

Seasonal weather forecasts can be made if the answers to these two questions are satisfactory: (1) How closely do ocean surface temperatures control the weather? and (2) To what extent is it possible to forecast the distribution of water-surface temperature departures over the oceans?

How can these be answered? Ocean temperatures directly affect the weather of leeward shores; and indirectly through modifications of pressure distribution they may control the weather far from the coast. The value of ocean temperatures for seasonal forecasts can, therefore, be determined (1) by direct comparison of weather with the water temperatures at the same time; and (2) by making classifications of types of water temperature distribution for each of the twelve months and then finding the similarities of the pressure distributions accompanying each occurrence of each type. With the typical pressure distributions which may be found connected with the types of water temperature distribution, the weather to be expected over wide areas can be easily determined.

Ocean currents and drifts have been observed so long that we know their general directions and rates of movement, in some cases even by months. Marked temperature departures must move in the waters in which they occur, though their identities may soon be lost through the great mixing of oceanic surface waters. In spite of mixing, however, more than a chance correlation is to be expected between great temperature departures in a current and those occurring even a year later thousands of miles away in the direction toward which the current flows. And if one makes combinations of temperature departures in the major currents which take part in the water flow to a distant area, the result may be found to approximate closely the temperatures as observed.

The tentative results already obtained from meager data seem to justify a thorough investigation of the temperature movements of ocean surface waters and their relation to the weather of the neighboring or even of distant continents.

CHARLES F. BROOKS

GEOGRAPHICAL NEWS

Officers of the Association of American Geographers for 1918. The following officers have been elected by the Association of American Geographers for 1918:

President, Nevin M. Fenneman; *First Vice-President*, Charles R. Dryer; *Second Vice-President*, Bailey Willis; *Secretary*, Oliver L. Fassig; *Councilor*, Walter S. Tower; *Treasurer*, François E. Matthes.

PERSONAL

DR. W. C. FARABEE gave a lecture on his recent expedition under the title "Exploration in the Valley of the Amazon" before the Geographic Society of Chicago on December 14, 1917.

DR. ALEŠ HRDLÍČKA, Curator of Physical Anthropology of the U. S. National Museum, addressed the Anthropological Society of Washington on October 2, 1917, on "Bohemia and the Bohemians."

PROFESSOR D. W. JOHNSON of Columbia University read a paper entitled "The Physiography of the Italian Front" before the New York Academy of Sciences on January 21.

MR. DONALD B. MACMILLAN, leader of the Crocker Land Expedition, gave a lecture before the Geographical Society of Philadelphia on December 5, 1917, on the activities of the expedition in the Arctic, entitled "In Search of New Arctic Lands."

MR. P. LEE PHILLIPS, Chief of the Division of Maps of the Library of Congress, is collecting data about Bernard Romans, 1720(?)–1784, author of the "Concise History of East and West Florida," for the purpose of reproducing his map of Florida, 1774, the only known copy of which is in the Library of Congress. Mr. Phillips desires to locate Romans' works, including other maps he compiled, and to find out the whereabouts of his manuscripts, especially the diary which he is supposed to have left. Any information on this matter would be gratefully received by Mr. Phillips. Ultimately a facsimile reproduction of the Romans map of Florida may be published similar to that of Filson's "Map of Kentucke," 1784, published by W. H. Loudermilk & Co. of Washington, D. C. under the editorship of Mr. Phillips.

DR. E. L. STEVENSON of the Hispanic Society of America gave a series of five lectures on "New World Cartography" at the University of California during November. The titles and dates were as follows: "Medieval Geography: The Heritage from Antiquity and the Contribution to Earth Knowledge in the Pre-Renaissance Period," November 21; "The Expansion of Geographical Knowledge in the Early Renaissance Period: Overland Exploration and Discovery in Regions beyond Europe, and the Beginnings of Trans-Oceanic Expansion," November 22; "The Earliest Explorations and Discoveries in the New World: Conceptions of the Geography of the Newly Found Regions, and the Record As Left by the Contemporary Map Makers," November 23; "The Progress of Discovery As Recorded in the Spanish and the Spanish-Italian Maps: The First Half-Century of New World Geography," November 26; "The Mapping of French and English Explorations in the New World," November 27.

DR. GRIFFITH TAYLOR of the Australian Commonwealth Bureau of Meteorology was awarded the gold medal of the Royal Geographical Society of Queensland at Melbourne on November 9, 1917. The award was made for a paper on the settlement of tropical Australia. The paper deals especially with the control of vegetation and settlement by temperature and rainfall and is related to the general line of research to which Dr. Taylor has been devoting himself since his return from the Antarctic, the published results of which have been discussed in the *Review* for May 1916, p. 396, Nov. 1917, pp. 401–403, and Jan. 1918, pp. 77 and 86. The paper, which is accompanied by numerous original maps and diagrams, will be published in 1918 by the Queensland Branch of the Royal Geographical Society of Australasia, Brisbane.

MR. NORMAN TAYLOR is giving a course on phytogeography at the Brooklyn Botanic Garden.

MR. H. CHARLES WOODS, who lectured before this Society on January 8, delivered his lecture on "The Bagdad Railway in the War" before the Geographical Society of Philadelphia on January 18.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

ALASKA

ARKER, G. H. **The fur-seals of the Pribilof Islands.** Maps, ills. *Scientific Monthly*, Vol. 4, 1917, No. 5, pp. 385-409.

In this clear account of the fur seals of the Pribilof Islands Professor H. G. Parker emphasizes not only the financial gain which the United States has already received from these animals but the prospect of a large and continuous revenue from them for an indefinite future. Thus the amount of legislation and controversy which the seals have occasioned is justified by their importance. Three herds of fur seals breed in the North Pacific. The smaller herd is under the care of Japan, the next, which breed on the Commander Islands west of the Aleutian chain, is controlled by Russia, but by far the largest herd is that which breeds on the Pribilof Islands under the management of the United States. The breeding season is the one time of year when careful observations can be made of the fur seal's habits. In the spring the mature males repair to certain spots on the beach to await the coming of the females. By the middle of June the latter begin to arrive. Within a few days of her arrival the female gives birth to a single "pup" and shortly after is impregnated by the bull. It is calculated therefore that the period during which the young are carried must be a year less about a week. Since each male, or bull, maintains a harem of about forty females, it is obvious that there must be an excess of males. These form a disturbing element which can be removed without loss to the herd. Their pelts are in the most marketable condition at three years. Professor Parker therefore recommends that a certain part, calculated at 8 per cent, of the three-year-old bachelors be retained and the others be killed. The present law forbids the killing of these males until after the season of 1917 and then an annual reserve is to be made of not fewer than 5,000, evidently a less scientific arrangement than that of reserving a certain percentage of the herd. Killing in the open sea, now suspended by treaty between the United States, Great Britain, Russia, and Japan, is utterly condemned. In pelagic sealing great numbers of females are killed whose pups die subsequently of starvation. The bodies of many of those killed at sea are lost. From these causes an enormous waste occurs without any corresponding benefit.

R. H. JONES

— **Alaska, Report on the work of the Bureau of Education for the natives of, 1914-15.** 85 pp.; map, ills. *Bur. of Education Bull.*, 1916, No. 47. Dept. of the Interior, Washington, D. C., 1917. [The sections on the reindeer service are referred to in a note in the *July Review*, Vol. 4, 1917, p. 55. See also previous report, *Geogr. Rev.*, Vol. 1, 1916, p. 228.]

— **Alaska (United States Coast Pilot). Part II: Yakutat Bay to Arctic Ocean.** 303 pp.; index. *U. S. Coast and Geodetic Survey Serial No. 34.* Washington, D. C., 1916.

— **Alaska's New Railway.** Ills. *Natl. Geogr. Mag.*, Vol. 28, 1915, No. 6, pp. 567-589.

ANDREWS, C. L. **Alaska under the Russians: Baranof, the builder.** *Washington Hist. Quart.*, Vol. 7, 1916, No. 3, pp. 202-216.

ANDREWS, C. L. **Alaska under the Russians: Industry, trade, and social life.** *Washington Hist. Quart.*, Vol. 7, 1916, No. 4, pp. 278-295.

AUER, H. A. **Camp fires in the Yukon.** x and 204 pp.; maps, ills. Stewart & Kidd Co., Cincinnati, 1916. \$1.75. 8½ x 5½. [A record of "the writer's experiences and observations as a hunter of big game in the Yukon just as they happened day by day and set down in my [his] diary at the time the events narrated transpired." The route lay from the end of the railroad at Whitehorse west along the landward side of the St. Elias Range.]

BROOKS, A. H., AND OTHERS. **Mineral resources of Alaska: Report on progress of investigations in 1915.** 279 and x pp.; maps, diagrs., index. *U. S. Geol. Survey Bull.* 642. Washington, D. C., 1916.

CAPPS, S. R. **A game country without rival in America: The proposed Mount McKinley National Park.** Map, diagr., ills. *Natl. Geogr. Mag.*, Vol. 31, 1917, No. 1, pp. 69-84. [An informing description of the scenery and wild life in this proposed Alaskan national park.]

CAPPS, S. R. **The Chisana-White River district, Alaska.** 130 pp.; maps, diagrs., ills., index. *U. S. Geol. Survey Bull.* 630. Washington, D. C., 1916. [From a geographic viewpoint this report on a region adjoining the Alaska-Yukon boundary line east of Mt. Wrangell is interesting chiefly on account of a section on the influence of rock types on topography and also for a section on vegetation. The latter is accompanied by a useful map showing the distribution of timber, chiefly in belts along the valley floors.]

CLAXTON, P. P. **Alaskan conditions.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and Other Dependent Peoples*, Oct. 20, 21, and 22, 1915, pp. 76-81.

COLBERT, L. O., AND J. A. DANIELS. **Wire-drag work in Alaska.** 31 pp.; maps, diagrs., ills. *U. S. Coast and Geodetic Survey Special Publ.* No. 34. Washington, D. C., 1916. [Deals with the new method of detecting submerged rocks and other inconspicuous dangers to navigation which escape discovery by the usual methods of surveying.]

CRANE, W. R. **Transportation problems in Alaska.** ills. *Official Proc. Richmond Railroad Club*, Vol. 15, 1916, No. 3, pp. 4-29 (discussion, pp. 26-29).

CUNNINGHAM, AUSTIN. **Brave deeds of our Arctic Signal Corps.** ills. *Red Cross Mag.*, Vol. 12, 1917, No. 3, pp. 90-97. [Alaska.]

EAKIN, H. M. **The Quaternary history of central Alaska.** *Journ. Washington Acad. of Sci.*, Vol. 7, 1917, No. 3, p. 81. [Abstract of paper read at the meeting of the Geological Society of Washington, Nov. 22, 1916.]

ELLIS, CARLYLE. **Some American glaciers: Alaska and the northwest coast furnish varied specimens.** ills. *Scientific American Suppl.*, No. 2104, Vol. 81, 1916, Apr. 29, pp. 280-281. [Including the Valdez Glacier that has figured largely in human geography because of providing a route for the Klondike trail of 1898.]

EMMONS, G. T. **The whale house of the Chilkat.** Diagr., ills. *Amer. Museum Journ.*, Vol. 16, 1916, No. 7, pp. 451-464.

CANADA

Ontario, Quebec

CUMBERLAND, BARLOW. **A century of sail and steam on the Niagara River.** xvi and 198 pp.; diagrs., ills., index. The Musson Book Company, Ltd., Toronto, 1913. \$1.50. 9½ x 6½.

Of interest to those who dwell or travel along the Niagara River or who have had some share in the development of its traffic. Apart from a few historical references, the book is almost entirely a record of the successive eras of travel on the river; first, a story of canoes and sailing craft, then an era of steam, this in turn followed by a period of decadence of river traffic when rail transportation offered a strenuous competition, and finally the inauguration of a new period of activity and success under the Niagara Navigation Company. It is a history of boats more than of trade as is clearly shown in the chapter, "On the Upper Lakes with the Wolseley Expedition and Lord Dufferin," which details a stage in the career of the steamer *Chicora* rather than diplomatic or expeditionary triumphs.

The book meets the intentions of the promoters but it will be a disappointment to any who from the title infer that it is a comprehensive history of shipping on this important stream connecting two of the Great Lakes.

ROBERT M. BROWN

AMY, LACEY. **Labrador, home of the iceberg.** ills. *Travel*, Vol. 27, 1916, No. 1, pp. 24-27 and 52-53. [Description of the fishermen and villages of the coast. The population shrinks from 30,000 in a good cod summer to 2,000 resident fishermen in winter.]

DAWSON, W. B. **Tide tables for the eastern coasts of Canada for the year 1917, including the River and Gulf of St. Lawrence, the Atlantic coast, the Bay of Fundy, Northumberland and Cabot Straits; and information on currents.** 63 pp. Tidal and Current Survey, Dept. of Naval Service of the Dominion of Canada, Ottawa, 1916.

GRENFELL, W. T. **The year's work in Labrador.** *Journ. Natl. Inst. of Social Sci.*, Vol. 1, 1915, No. 1, pp. 106-113. New York.

HAWKES, E. W. **The Labrador Eskimo.** x and 235 pp.; map, diagrs., ills., bibliogr. *Geol. Survey of Canada Memoir* 91: *Anthropol. Ser.* No. 14. Ottawa, 1916.

LEVASSEUR, N. *La construction des navires à Québec: Précis historique.* *Bull. Soc. de Géogr. de Québec*, Vol. 11, 1917, No. 4, pp. 187-201.

MAGNAN, HORMISDAS. *Les réserves de colonisation.* *Bull. Soc. de Géogr. de Québec*, Vol. 10, 1916, No. 3, pp. 136-143. [Notes on the wise policy initiated in Quebec Province in 1902.]

— *Quebec, Province of: Statistical Year-Book, 3rd year.* xii and 609 pp.; map, diagr., index. Bureau of Statistics, Quebec, 1916.

REINECKE, L. *Road material surveys in Ontario and Quebec.* *Summary Rept. Geol. Survey of Canada for 1915*, pp. 147-155. Ottawa, 1916.

ROUILLARD, E. *Les îles de la province de Québec.* *Bull. Soc. de Géogr. de Québec*, Vol. 10, 1916, No. 1, pp. 23-33; No. 2, pp. 105-115. [A gazetteer of the more important and interesting islands of Quebec Province: Part I, A-J; Part II, K-V.]

SIMARD, H. *La Côte-Nord: Esquisse de la région et des mœurs de ses habitants.* *Bull. Soc. de Géogr. de Québec*, Vol. 11, 1917, No. 4, pp. 203-216. [The north shore of the Gulf of St. Lawrence.]

SULTE, BENJAMIN. *Le petit-poisson.* *Bull. Soc. de Géogr. de Québec*, Vol. 10, 1916, No. 2, pp. 67-73. [The fish so designated by the populace of Three Rivers is a small codlike species known to the French-Canadian in general as "petite-morue," to the English-speaking section as "tommy cod." Amongst the immigrant fishes of the Canadian seas it is the one that penetrates farthest into the interior waters. It arrives at Three Rivers on Christmas Eve and for 15 days is harvested through the ice.]

UNITED STATES

General

DAY, P. C. *Relative humidities and vapor pressures over the United States, including a discussion of data from recording hair hygrometers.* 61 pp.; maps, diagrs. *Monthly Weather Rev. Suppl. No. 6.* U. S. Dept. of Agriculture, Washington, D. C., 1917.

It is an encouraging sign of the rising standard of the work of the Weather Bureau that more and more attention is being paid to the careful, accurate, and thoroughly scientific summarizing, charting, and discussion of many of the essential elements and phenomena of our climate. Well-merited criticism has, for many years, been directed against much of our meteorological work by our foreign colleagues, because we published and charted data without adequate attention to their accuracy, without using homogeneous series, and without reducing the data employed to the same period of time. All this has rapidly changed. Within a few months there have been several important studies, published in the *Monthly Weather Review* or in the *Supplement to the Monthly Weather Review*, which have stood the test of criticism and have added greatly to our knowledge of the meteorology and climatology of the United States.

The investigation of relative humidity and vapor pressure now before us covers its field well. The most important humidity observations made by the Weather Bureau are those at 8 A. M. and 8 P. M., Eastern Standard Time, and cover the period since July, 1888. These data, for the period January, 1889, through December, 1913, for nearly 200 stations, are tabulated in full. The values are also charted for the months of January, April, July, and October (Charts 1-8). The 8 A. M. and 8 P. M. observations do not give the daily means. Corrections for reducing the mean values at those hours to the true daily mean are given (Table 5). The daily march of relative humidity and the variations from hour to hour are, of course, not indicated by the data for 8 A. M. and 8 P. M. During a period of about five years, however (1881-1886), five observations of relative humidity were made daily at the then regular stations of the Signal Service (7 and 11 A. M.; 3, 7, and 11 P. M., Washington time). The mean values for these observations are tabulated (Table 2) and are graphically shown for 3 and 11 P. M. for the mid-winter, mid-spring, mid-summer, and mid-autumn months (Charts 9-16). In 1876-1880 another series of observations was made at 2 P. M., local time. These values are tabulated (Table 3) and are also charted for each of the mid-season months (Charts 17-20). The data for these different series of observations are, obviously, not strictly comparable. The daily march of relative humidity, vapor pressure, and temperature, and also the vapor pressure at saturation, compiled at the even hours from the records of self-recording instruments, are shown for six selected stations (Figs. 4 and 5). The average daily minimum relative humidities for the regular observing stations of the Bureau for April, July, and October have been computed (Table 7) and charted (Charts 21-23). The mean maximum temperature and the corresponding computed depression of the wet-bulb

thermometer are also given (Table 7) and charted (Charts 24-26). The depression of the wet-bulb thermometer is important as giving some indication of one's physical comfort or discomfort at high temperatures.

Among the other matters included in Mr. Day's report may be mentioned, as of special interest, the curves of annual march of relative humidity (8 A. M. and 8 P. M.) for selected stations (Figs. 1-3). Absolute humidity also receives its share of attention, in tables, figures, and charts.

Mr. Day's monograph deserves careful study on the part of all those who are concerned with matters in which atmospheric humidity plays a part. Many interesting points might be referred to here, if space were available. To note only one of these, which we do not recall to have seen emphasized before: In the cases of both Mt. Washington and Pike's Peak (Table 2) the percentages of relative humidity are continuously high, with small monthly and diurnal variations: On the lee side of these mountains, even at high elevations, the humidities are comparatively low, the obvious result of loss of moisture in the air in passing over the mountains and of the decrease in humidity due to adiabatic warming of the air descending on the leeward side.

As a matter of general interest we wish that a bibliography of the earlier humidity charts and their discussion had been included.

R. DEC. WARD

— **Intracoastal waterway, Boston, Mass., to Beaufort, N. C.: Final report on sections from New York Bay to Delaware River and from Delaware River to Chesapeake Bay.** 16 pp. *House of Repr. Doc. 196, 63rd Congr., 1st Sess.*, Washington, D. C., 1913.

It is advised that the Chesapeake and Delaware Canal be purchased and enlarged to a sea-level canal of 12 feet depth and 90 feet bottom width with the least interference practicable to present traffic, at a cost including the first year's maintenance of \$8,000,000. Further deepening to 25 feet should await observation of the commerce of the improved waterway, and, if adopted, should depend on co-operation by the local states.

Regarding the waterway from the Delaware River to New York Bay, a lock canal, costing \$20,000,000, of 12 feet depth and 90 feet bottom width, built at public expense, is recommended, provided that the state of New Jersey secure and donate to the United States Government all rights of way necessary for a 125-foot bottom width, 25-foot depth, sea-level canal along the same route.

It is somewhat singular that the report of "The Special Board of Engineers," dated 1912, is printed after the final report of 1913 and contains a suggestion which is ignored in the final report to the effect that the 12-foot canal from New York Bay to the Delaware River would be of little use, and that enlargement of such a canal after construction would entail great expense. The Special Board therefore recommended the original plan of 125 feet bottom width and 25 feet depth, and in the Delaware River-Chesapeake Bay section a 12-foot sea-level canal, to be later deepened to 25 feet.

R. H. JONES

MARVIN, GEORGE. **The Great River: The war on the Mississippi; Controlling the Mississippi; The sovereignty of the Mississippi; Navigating the Mississippi.** Maps, diagrs., ills. *World's Work*, Vol. 30, 1915, No. 1, pp. 49-65; No. 2, pp. 213-237; No. 4, pp. 469-485; No. 5, pp. 584-604.

The Mississippi River problem is not a local problem but a national one, and while control of the river vitally concerns a large number of communities bordering the stream, a regulated Mississippi would benefit the people far beyond the boundaries of the riparian states. Mr. Marvin's articles are, then, in the line of public education and deserve the careful consideration of the people in all sections of the country. The free use of illustrations makes the arguments compelling, while the broad discussion of the divers schemes and policies of controls yields an adequate background to his plea for a settled policy. The writer carries the figure of an invading army throughout his discussion with considerable success; but at times it is overdone, as when a picture of the flooded Main Street in Dayton, Ohio, is entitled "Louvain," and the map of the flooded area of the river is called "The periodical Belgium of the Mississippi." Among the "troubles" to which the great river is subjected, Mr. Marvin mentions the Mississippi River Commission and the Mississippi River Levee Association. These, in his opinion, defeat the solution of the river problem, because the members are not actually "on the job" as in the case of the Ohio River Board and also because they are tied up to "special pieces of legislation." On the whole, the treatment, although popular in style, is fairly conceived and soundly conducted. Everyone must regret the lack of unanimity of mind and action concerning the river improvements, but, until the problem is faced squarely as a national issue, partisan legislators and local promoters will continue to exact appropriations for temporary needs.

ROBERT M. BROWN

— **River regulation, flood control, and water conservation and utilization.** 430 pp. Hearings before the Committee on Commerce, U. S. Senate, 64th Congress, 2nd Session, on H. R. 14777 and S. 5736. Washington, D. C., 1917.

In brief this publication covers the hearings and reports on the Flood Control Act and the Newlands Bill. As a result of all the reports on waterways which the Government has issued in recent years one might expect that some tentative plan would be evolved, but one Congress after another delays adequate action, and conditions are as unsatisfactory as ever. The public is treated almost yearly to a rather disgraceful discussion of the River and Harbor Appropriation Bill; the result of this in Congress has been to cut down the amount of the appropriation, and the people at large are being convinced that appropriation bills mean unfair if not dishonest legislation and that waterway bills are particularly to be distrusted. To offset the diminishing appropriation of the River and Harbor Bills, specific bills and acts are introduced by special boards into each Congress and the appropriations of such of these as pass, added to the current rivers and harbors bill appropriation, must be considered the total appropriation. One of the subsidiary bills of the 64th Congress was the so-called Flood Control Bill (*House of Repr. Bill No. 14777, 64th Congr., 2nd Sess.*). This act provided for the control of the floods of the Mississippi and Sacramento Rivers notwithstanding the fact that the River and Harbor Bill of the same Congress allotted a sum to the Mississippi River Commission for flood control, among other things, and also provided some money for the Sacramento River. The reason for this is not altogether clear, but some light is thrown upon the situation by J. Hampton Moore in his speech before the Atlantic Deeper Waterways Association in 1916. "In other words," said Mr. Moore, "the advocates of flood control started out to go it alone and then 'came back to father,' awaiting their opportunity to leave 'father' next year if they can obtain the larger and independent appropriation from Congress."

A serious situation confronts the people because of the number of waterways associations which are clamoring for appropriations for their special hobby. This has led to the so-called Newlands Bill (*Senate Bill No. 5736, 64th Congr., 2nd Sess.*) which provides for all phases of our waterway needs. For instance, the act creating the Mississippi River Commission permits of no use of the appropriation to that Commission for water as a natural resource; a flood control bill may be inimical to the improvement of a river for a highway, for reclamation, or for a number of other uses. The Report of the Inland Waterways Commission (*Senate Doc. No. 325, 60th Congr., 1st Sess.*), published ten years ago, recommended the appointment of a general water-control board. The need of a national committee free from sectional interests and protected from associations riding a hobby to handle our waterway problem is stronger today than it was ten years ago. It is difficult to understand how Congressional committees can be exposed to such a report as this one and not catch something that would result in a slightly better act of Congress for waterways. It may be that this report has been put into the present form so as to hide as much information as possible. If one is diligent, however, especially when the appendixes are reached, a good idea of the need of this country in the way of water control may be obtained from this collection of hearings.

ROBERT M. BROWN

SCHOFF, W. H., edit. **Ninth Annual Convention of the Atlantic Deeper Waterways Association, held at Philadelphia, Pennsylvania, September 12, 13, 14, 15, 1916, . . . : Report of the proceedings.** 298 pp.; maps, ill., index. Atlantic Deeper Waterways Assoc., Philadelphia, 1917.

The significant features of this report are the annual address of the president, J. Hampton Moore, and the paper on "Some Problems of Inland Waterway Transportation," by General W. M. Black. Mr. Moore offers a report of progress on the Atlantic Intracoastal Waterway. It is stated here that the intracoastal waterway from New York to Jacksonville, Florida, requires now for its completion only 131 miles of digging and partial digging, estimated to cost about \$47,800,000. This project has two worthy purposes: one to facilitate coastwise traffic in general, a need which is especially imperative between Chesapeake Bay, Delaware Bay, and New York harbor; the other to provide in times of war for the coast movements of commodities and naval and army supplies in case off-shore traffic is impossible.

General Black offered, in his address, considerable trenchant advice concerning waterways which he based on actual experience. He deplored the slipshod and halfway measures which have been adopted by many of our inland waterway boards and suggested lines of procedure whereby the intracoastal waterway may be able to compete with ocean and rail carriers. His arguments, teeming with examples, make it clear that while waterways of navigable depth have long existed only those have been successful where

the overhead charges on the plant have been kept low, the operating expenses minimized and the influence of time in the movement of freight fully appreciated.

Both speakers, notwithstanding their zeal for waterways, retained a commendable attitude towards railway competition and were not inclined to use the railroad managers as scapegoats for their own failures.

ROBERT M. BROWN

— **Waterway to connect waters of Chesapeake and Delaware Bays: Report of the commission appointed by the President to examine and report upon a route for the construction of a free and open waterway to connect the waters of the Chesapeake and Delaware Bays.** 74 pp.; map, diagr. *Senate Doc. No. 215, 59th Congr., 2nd Sess.*, Washington, D. C., 1907.

Two routes are considered, the present Delaware and Chesapeake Canal and the Sassafras route. The commercial and military advantages of the two are about the same, but the first is preferred on account of greater cheapness. Its present value is estimated at \$2,514,290. A tide-level canal with a minimum full-depth width of 150 feet and mean low water depth of 35 feet with no locks is advocated. Jetties are to be built at the Delaware end to protect the channel from being obliterated by tidal flow. Bridges are to be high with draw spans. Annual dredging will be required. The total cost of such a waterway on this route is estimated at \$20,621,324, with an annual expenditure for maintenance of \$149,620. The commission reports that they found the business organizations and leading citizens of Baltimore, Wilmington, and Philadelphia practically unanimous in their demand for such a canal. While the chief use of the canal is expected to be in the transportation of coal and lumber, it is pointed out also that it would relieve the coastwise traffic of a dangerous sea route, saving both time and expense to the trade movements of the whole country.

It is proposed to have either end of the canal protected by sufficient coast defenses to render its passage at all times open. The Civil War is cited to show the value of the canal for the transportation of troops and supplies. On April 17, 1861, Virginia seceded from the Union and started her troops north to Washington. Two days later every bridge on the Philadelphia, Baltimore, and Washington Railroad was burned from Baltimore to the Susquehanna River, severing all rail connections along the seaboard to Washington. Then the Government seized all the propeller steamers in Philadelphia that could pass through the Chesapeake and Delaware Canal and used them for conveying troops and supplies to Washington. Throughout the war the canal played a most useful part in supplying the Army of the Potomac in the field.

R. H. JONES

MOORE, J. H. **Canals for defense.** Speeches in the House of Representatives, June 13, 1916. 20 pp. Washington, D. C. [Reprint from *Congressional Record*.]

MORLEW, JOHN. **New boats on an old river.** Ill. *Commercial America*, Vol. 13, 1916-17, No. 7, pp. 17 and 19. [“The inauguration of a service of power barges of many novel features marks the beginning of new era in the transportation history of the Mississippi.”]

PARKER, WALTER. **Transportation problems of the Mississippi Valley.** *Commerce Repts.*, 1917, No. 164, pp. 188-189. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

REED, W. G. **The probable growing season.** Diagr. *Monthly Weather Rev.*, Vol. 44, 1916, No. 9, pp. 509-512. [For an article on a related topic, see “Weather as a Business Risk in Farming,” by W. G. Reed and H. R. Tolley, in the July, 1916, *Review*, Vol. 2, pp. 48-53.]

SCHOFF, W. H. **The Mississippi River improvement.** 44 pp.; maps, diagrs., ills. Reprinted from *Commercial America*, Vol. 12, 1915-16, Nos. 4-6.

SMITH, E. H. **New York-Chicago aerial mail lines.** Maps, ills. *Flying*, Vol. 5, 1917, No. 12, pp. 504-506. [Abstracted in the March, 1917, *Review*, Vol. 3, p. 241.]

— **Southern states, Public road mileage and revenues in the, 1914: A compilation showing mileage of improved and unimproved roads, sources and amounts of road revenues, bonds issued and outstanding, and a description of the systems of road administration, fiscal management and other factors affecting road improvement in each state.** 52 and lxxi pp.; diagrs. *U. S. Dept. of Agric. Bull. No. 387*. Washington, D. C., 1917.

— **U. S. Geographic Board, Decisions of the.** 3 pp. Nov. 1 and Dec. 6, 1916. U. S. Geographic Board, Washington, D. C.

WARD, R. DEC. **The prevailing winds of the United States.** Maps, bibliogr. *Annals Assoc. Amer. Geogrs.*, Vol. 6, 1916, pp. 99-119.

WELLS, W. C. **The metric standard.** *Bull. Pan American Union*, Vol. 44, 1917, No. 1, pp. 22-28.

GANNETT, HENRY. **Contour map of the United States.** 1:7,000,000. U. S. Geological Survey, Washington, 1916. [The newest edition of the Survey's standard small contour map of the United States.]

— **United States, National forests of the.** [1:12,600,000.] Forest Service, U. S. Dept. of Agriculture, Washington, D. C., 1917.

North-Central States

— **St. Paul, city of, Annual report of the Commissioner of Public Works for the year ending December 31, 1916.** 160 pp.; maps, index. Dept. of Public Works, St. Paul.

SCOTT, WILL. **Report on the lakes of the Tippecanoe basin (Indiana).** 39 pp.; maps, diags. *Indiana University Study No. 31* (= Vol. 3, 1916, July).

SMITH, J. W. **Agricultural meteorology.** Diags., bibliogr. *Proc. Ohio Acad. Sci.*, Vol. 6, 1915, Part V, pp. 239-264. [Abstracted in the October, 1917, *Review*, Vol. 4, p. 317. Deals mainly with the Middle West.]

VAN CLEEF, EUGENE. **Duluth, a product of the waterways.** Map. *Journ. of Geogr.*, Vol. 15, 1916-17, No. 6, pp. 189-191.

VOGT, P. L. **Village growth and decline in Ohio.** Map. From *The American City*, Vol. 13, 1915, No. 6, pp. 481-485.

WINCHESTER, D. E., C. J. HARES, E. R. LLOYD, AND E. M. PARKS. **The lignite field of northwestern South Dakota.** 169 pp.; maps, diags., ills., bibliogr., index. *U. S. Geol. Survey Bull. 627*. Washington, D. C., 1916. [Accompanied by geologic maps of Harding and Perkins Counties, each 1:125,000.]

YOUNG, L. E. **Surface subsidence in Illinois resulting from coal mining.** 112 pp.; maps, diags., ills., index. *Illinois State Geol. Survey Bull. 17*. Urbana, 1916.

ZIEGLER, VICTOR. **The potash deposits of the sand hills region of northwestern Nebraska.** Maps, diags., ills. *Colorado School of Mines Quart.*, Vol. 10, 1915, No. 3, pp. 6-26. [Abstracted in the January, 1917, *Review*, Vol. 3, p. 67.]

— **[Topographic map of the United States.]** Five sheets, 1:62,500: *Kimmswick, (Mo.-Ill.)*; *Mechanicsburg, Milford Center, Morrow (Ohio)*; *Three Rivers (Mich.-Ind.)* U. S. Geol. Survey, Washington, D. C., 1916.

South-Central States

HARPER, R. M. **Economic botany of Alabama. Part 1: Geographical Report, including descriptions of the natural divisions of the state, their forests and forest industries, with quantitative analyses and statistical tables.** 228 pp.; map, ills., bibliogr., index. *Geol. Survey of Alabama Monograph 8*. University, Ala., 1913.

Although bearing date of 1913 and already previously listed (*Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 626) this work deserves notice because of its method, a method commented upon in the review of the same author's "Geography and Vegetation of Northern Florida" (March, 1917, *Review*, Vol. 3, pp. 409-410). The state of Alabama is divided into fifteen main forest regions. So close is the correlation between geology, topography, and soils, on the one hand, and vegetation on the other, that the forest map of the state which accompanies the report scarcely differs in the demarcation of the various geographical regions from a geological map of the same size. In discussing the various divisions, much the same scheme is followed as in the report on Florida, except that here, in treating the vegetation, attention is restricted to the forests. GEORGE E. NICHOLS

HALL, B. M., AND M. R. HALL. **Second report on the water powers of Alabama.** 448 pp.; maps, diags., ills., index. *Geol. Survey of Alabama Bull. No. 17*. University, Ala., 1916.

LOEB, E. M. **The assessing of scientific port charges and basis of method of such charges.** *Proc. and Papers of the Fourth Ann. Convention of the Amer. Assoc. of Port Authorities, Held at Los Angeles, Cal., Sept. 13-15, 1915*, pp. 173-184. New York, n. d. [Relative to the port of New Orleans.]

PETERS, M. E. **Texas trails.** *Proc. Mississippi Valley Hist. Assoc. for the Year 1913-14*, Vol. 7, pp. 55-66. Torch Press, Cedar Rapids, Ia., 1914.

SMITH, H. W. River-stage forecasts for the Arkansas River, Dardanelle to Pin Bluff, Ark. Map, diagrs. *Monthly Weather Rev.*, Vol. 44, 1916, No. 3, pp. 143-150.

STEPHENSON, L. W., AND A. F. CRIDER. Geology and ground waters of north eastern Arkansas. With a discussion of the chemical character of the waters by R. I. Dole. 315 pp.; maps, diagrs., ill., bibliogr., index. *U. S. Geol. Survey Water-Supply Paper 399*. Washington, D. C., 1916. [With two pages on the physiographic province of Arkansas, a section on physiography, and a geological map of the northeastern part of the state prepared by the authors under the direction of T. Wayland Vaughan, base in the extreme southwest on A. C. Veatch's map, Pl. III, *U. S. Geol. Survey Professional Paper 46*, 1906.]

WIGHT, F. C. Five days on the Mississippi. Map, diagrs., ill. *Engineering News*, Vol. 76, 1916, No. 24, pp. 1114-1119. [River below Memphis.]

MEXICO AND CENTRAL AMERICA

BLAKESLEE, G. H. The results of the Panama Canal on world trade. I: North America. II: South America and the Far East. *Outlook*, Vol. 3, 1915, No. 9 pp. 490-497; No. 13, pp. 717-722. New York.

The period under consideration is the first year of operation—a period which coincides with the first year of the European War. On the whole, the tonnage using the canal showed disappointing results. This was due not so much to the small trade of the United States using the canal, for it was reasonably heavy; the great shortage from what had been predicted was due, in large part, to a marked lack of European mercantile tonnage on the high seas. During the first year of operation, the canal handled, in the trade between the United States and South America, about 300,000 registered tons of shipping more than had been predicted in the official estimates. In the trade with the Far East, our ships had almost a complete monopoly. The European War has entirely upset all calculations as to canal traffic. The writer thinks, however, that when the great war is over and the world's trade and industries have adjusted themselves to the Panama route, the official estimates of traffic and tolls will be surpassed.

AVARD L. BISHOP

GOETHALS, G. W. Government of the Canal Zone. 106 pp., ill., index. (The Stanford Little Lectures for 1915.) Princeton University Press, Princeton, 1915. \$1.00. 8 x 5½.

The author treats of the difficulties encountered by the United States in selecting a suitable government for the Canal Zone. Delicate political relations entered into the question, but many of the problems were geographical. Temperate-zone colonies established in the tropics demand a specialized form of government. Distance from the seat of authority requires that the local governor be vested with unusual powers. Since the population of the Canal Zone produces little in the way of foodstuffs and as the Isthmus is the meeting places of vessels from many distant lands, often in need of provisions, the government established must enter the economic field and handle large supplies of food and fuel. Problems of labor, city planning, and sanitation as well as the completion, control, and operation of the Canal depend upon the Zone authorities for solution. The form of government adopted by the Panama Canal Act, which went into effect on April 1, 1914, provides for this complex administration. A government by executive order was established. The President of the United States names the Governor, who discharges all the varied duties of the post. The Act authorizes the practical depopulation of the Canal Zone, and the entire strip of some 450 square miles, except about 3,000 acres kept clear for sanitation, is to be left in jungle. Hence the population of the Zone will remain small, and the principal duties of the Governor will be the operation and maintenance of the Canal. This gives a flexible, easily adapted system of control. In case of war the President designates an army officer who assumes complete charge, civil and military, of the Canal and Canal Zone.

AGRAMONTE, D. F. La República de Guatemala en 1916. *Rev. de Geogr. Colon. y Mercantil*, Vol. 14, 1917, No. 9, pp. 322-334. Real Soc. Geogr., Madrid. [Extract from *Memoria Comercial*.]

AVALOS, J. F. México próspero: Su política financiera y su política agraria. 42 pp. Mexican Embassy, Washington, D. C., 1915.

AYMÉ-MARTIN, H. Le pétrole au Mexique. *Bull. Soc. de Géogr. Comm. de Paris*, Vol. 38, 1916, No. 7-8-9, pp. 410-433.

BALAREZO, MANUEL. Colonización de la Baja California. *Bol. Oficial de la Secretaría de Fomento*, Vol. 2, 1917, No. 2, pp. 110-133. Mexico. [A colonization project based upon the agrarian system of New Zealand.]

BARRETT, JOHN. **Mexico: A review and a forecast.** Ills. *Bull. Pan American Union*, Vol. 44, 1917, No. 1, pp. 41-57. [Reprinted from the *Yale Review* for January, 1917.]

BARRON, C. W. **The Mexican problem.** With introduction by Talcott Williams. xv and 136 pp.; map, ill. Houghton Mifflin Co., Boston and New York, 1917. \$1.00. 1½ x 5. [The author maintains that the problem is political rather than economic.]

BIGOT, RAOUL. **Le Mexique moderne.** 272 pp.; ill. Pierre Roger & Cie, Paris, 1909. 4 fr. 8 x 5½. [Mexico's gradual return to stable conditions lends fresh interest to any conscientious observer's account of the country. In this book the author presents a picture of Mexicans at home and at work and supplies a general economic survey. He appears particularly interested in their customs and their industries, and his interest has been strong enough to provide attractive reading. The text, however, is weak in regional descriptions, of which it supplies almost none.]

— **Canal Record: Vol. 9; August 25, 1915 to August 16, 1916.** Published weekly under the authority and supervision of the Panama Canal. 448 pp.; maps, diagrs., ill., index. Balboa Heights, Canal Zone, 1916. 12 x 9.

— **Catálogos de los seismos registrados durante el año de 1912 en la Estación Seismológica Central, Tacubaya; en las estaciones seismológicas de primer orden de Mérida, Yuc., y de Zacatecas y en las de segundo orden de Oaxaca y de Mazatlán. Catálogo de los macroseismos sentidos en la República Mexicana durante el año de 1912.** Map. *Parergones del Inst. Geol. de Mexico*, Vol. 5, 1914, No. 6-8, pp. 230-349.

— **Centro-América, Monografía de las cinco repúblicas de.** 47 pp.; maps, ill. Publ. de la Oficina Internacional Centro-Americana. Sanchez & De Guise, Guatemala, 1915. 10 x 7.

— **Chiapas, The state of.** Ills. *Mexican Rev.*, Vol. 2, 1917, No. 3, pp. 4-5. Washington, D. C.

— **Costa Rica: General descriptive data.** 31 pp.; ill. Pan American Union, Washington, D. C., 1916.

— **Costa Rica, República de: Anuario Estadístico, Vol. 19, Año 1915.** xlviii and 460 pp. San José, 1917.

ELLIOTT, L. E. **Guatemala: Land of yesterday and to-day.** Ills. *Pan-American Mag.*, Vol. 24, 1916, No. 2, pp. 64-84. [This number of the *Pan-American Magazine* is devoted to Guatemala. Besides the article listed above it includes others of economic interest on the republic.]

FLORES, TEODORO. **El petróleo Mejicano.** Diagrs., ill. *Bol. Soc. Nacional de Minería*, No. 227, Vol. 29, 1917, pp. 65-92. Santiago de Chile.

FONSECA, P. S. **Curso de geografía de El Salvador.** 159 pp.; map, diagrs., ill. Dutriz Hermanos, San Salvador, 1916. 7½ x 5½.

FONSECA, P. S. **Las relaciones comerciales de El Salvador y los Estados Unidos de América.** vii and 46 pp. [Publ. of] Second Pan-American Scientific Congress, Section 9, December, 1915. Washington, D. C.

FRANK, J. C. **American interoceanic canals: A list of references in the New York Public Library.** 90 pp.; index. Public Library, New York, 1916. [It is scarcely necessary to point out the usefulness of a publication of this type, specially valuable in this particular instance because of the widespread interest of the theme. The list is classified under the headings of bibliography, history, international relations and the four routes—Darien, Nicaragua, Panama, and Tehuantepec.]

GALLO, JOAQUIN. **Anuario del Observatorio Astronomico Nacional de Tacubaya para el año de 1917: Vol. 37.** 294 pp.; diagrs. Dir. de Estudios Geogr. y Climatol., Secretaría de Fomento, Mexico, 1916.

— **Guatemala: General descriptive data.** 31 pp.; ill. Pan American Union, Washington, D. C., 1916.

SOUTH AMERICA

GENERAL

FRANCK, H. A. **Vagabonding down the Andes: Being the narrative of a journey, chiefly afoot, from Panama to Buenos Aires.** xxi and 612 pp.; map, ill. The Century Co., New York, 1917. \$4.00. 9 x 6½.

A story of four years' tramping and observation among the mountain countries of

South America, by the author of "A Vagabond Journey Around the World," etc. The map opposite page 40 shows that Franck took the most direct routes from Bogotá to Quito, from Quito to Cuzco, from Cochabamba to Puerto Suárez. Yet he traveled almost entirely over ground unfamiliar to tourist, salesman, and scientist. After reading his account one can appreciate why travel routes in South America usually follow roundabout ways, why there has been no United States of South America, why political disunity is characteristic of those nations, why "unitary" republics are considered necessary, and why the local authority is often stronger than that of the central government. Mountain walls, bottomless gorges, bleak páramos, or unmapped wildernesses divide most of the centers of civilized life from one another. Even railroads overcome these obstacles but slowly.

Of the principal cities of South America one finds little account in this book. There are few facts concerning general commerce. The author devotes only limited space to history. The work is neither scientific nor literary. But it contains descriptions of landscape and human life that can be found in no other volume. There is a good deal of geography in it. The small towns of the Andean region are especially well portrayed. One who wants to know how the common people live in the secluded mountain districts, what they eat, how they dress, the character of their houses, their occupations, what are their products, and how those products are marketed, should read Franck's book. San Pablo (Colombia), where the making of Panama hats is a household industry, Azogues the seat of a weekly hat fair, Cajamarca, where Pizarro found the Inca taking his yearly bath in November as the natives do today, Huaráz, "capital of the most populous department in Perú," Huancayo with its great Sunday market, and Biblián, a city of pilgrimage, are places whose life is pictured by few other writers. Of these out-of-the-way places, decayed and still decaying remnants of Inca enterprise, left stranded on the highlands when Lima on the coast replaced mountain-rimmed Cuzco as the capital city, the book affords a good description. This, of course, is not a true picture of South America. It is one-sided. There is more of culture, of genuine hospitality, of industry and business, even of morals and education in South America than the author records. The perfectly natural temper of a footsore pedestrian has its effect, too, on the traveler's vision. But as a rule, the author of this narrative retains his sense of humor sufficiently to give an accurate description of things as they are. The work is thus a record of an achievement notable in itself and is especially valuable for the reason that it will probably be years before another keen observer will visit these out-of-the-way places and write his impressions of them.

— **América Latina, El comercio exterior de la, en 1915.** Diagr. *Bol. Unión Panamericana*, Vol. 44, 1917, No. 1, pp. 32-40.

BARD, H. E. **South America: Brief outline of study suggestions with bibliography.** 68 pp. D. C. Heath & Co., Boston, New York, Chicago, 1916. 7½ x 5. [A study outline, primarily embracing historical and social interests, is followed by a bibliography of about 200 books.]

BURROUGHS, W. G. **Coal fields of South America.** Ill. *Colliery Engineer*, Vol. 35, 1915, No. 12, pp. 643-644; Vol. 36, 1916, No. 1, pp. 30-31, No. 2, pp. 72-73; No. 3, pp. 153-155.

CURRAN, H. M. **Los bosques de la America del Sur.** Ills. *Bol. Unión Panamericana*, Vol. 44, 1917, No. 3, pp. 287-302.

FARABEE, W. C. **The South American Indian in his relation to geographic environment.** *Proc. Amer. Philos. Soc.*, Vol. 56, 1917, No. 3, pp. 281-288. Philadelphia.

— **Latin America, Special list of twenty-five books on.** (Suitable for use as supplementary reading and reference books in high schools, normal schools, and colleges.) *Hist. Teacher's Mag.*, Vol. 6, 1915, No. 3, pp. 86.

— **Latin America in 1916.** *South American Journ.*, Vol. 82, 1917, No. 2, pp. 21-51. [Annual review number.]

— **Puertos Sudamericanos de la costa oriental, El mejoramiento de los.** Ills. *Bol. Unión Panamericana*, Vol. 45, 1917, No. 4, pp. 421-441. [A brief description of harbor improvements made and planned as a result of the remarkable commercial development of the east coast of South America.]

REID, W. A. **Peruvian coast to Rio de Janeiro by rail.** Map, ill. *Bull. Pan American Union*, Vol. 44, 1917, No. 4, pp. 433-448.

REID, W. A. **South American port improvements—west coast, etc.** Map, ill. *Bull. Pan American Union*, Vol. 44, 1917, No. 2, pp. 141-165.

EUROPE

GENERAL

AYLE, C. E. **The great settlement.** With a prefatory note by the Viscount Esher. xix and 309 pp.; maps, index. John Murray, London, 1915. 6s. 7½ x 5.

Europe teems with problems bequeathed by its past history and raised by the present war. Of these Mr. Fayle shows himself both an interested student and one having knowledge to impart to his readers. He has confined himself, however, to a presentation of these problems without attempting to show that the subtle influence of time and place makes them break out periodically into new forms and that when we discuss the problem of Constantinople we are merely taking up a modern phase of the problem of the straits which interested the politicians and traders of Hellas and Troy no less passionately than it does contemporary business leaders and diplomatists.

Historical continuity of this character is based largely on geography, and the historian can rarely advance a single step without tracing his course on a map. To have interpreted all the problems taken up by Mr. Fayle with the help of the map would have added interest to his discussions of the present situation in Europe as well as in the overseas or overland regions to which the continent is tied by links of trade and intercourse.

MARRIOTT, J. A. R. **The Eastern Question: An historical study in European diplomacy.** viii and 456 pp.; maps, index. Oxford University Press, Oxford, 1917. 12s. 6d. 9 x 6.

A systematic account of the Eastern Question, which contributes to the general enlightenment on a particularly thorny problem. The author has treated with especial thoroughness the modern phase of this ancient question. Above all, the book is an excellent retrospect of Near Eastern events familiar to living generations. The need for radical changes in the international handling of Turkish and related problems is one of the logical conclusions to which the reader comes after laying the book down.

Here and there traces of haste will be noted. To consider the facts of political geography of the Balkans as "especially obscure" is for the author to ignore the excellent work of some of his countrymen not to mention that published in other countries. The specialized work of Hogarth, Newbigin, and Woods, to mention only a few British writers, testifies to the guidance available. He would have been nearer the mark had he merely expressed disapprobation of lay laxity in appreciating the fundamental relation of geography to history. But this condition is one which is improving constantly—the war, in particular, having accelerated progress.

The few sketch maps scattered in the first part of the book deserve greater credit for the intention than the execution, although the author tells his reader that they "are intended to elucidate" the facts of political geography. His admirably written text deserves sound cartographical accompaniment and loses somewhat by the want of it.

The chief treaties are carefully summarized, but no mention is made of the so-called Adriatic Treaty of April 27, 1915, between the Entente Powers and Italy, reference to which was made in the *British Review* as early as September, 1915.

ASHLEY, R. L. **Early European civilization: A textbook for secondary schools.** xxi and 708 pp.; maps, diags., ills., index. The Macmillan Co., New York, 1916. 7½ x 5.

BELTRÁN Y RÓZPIDE, RICARDO. **La geografía del Noroeste de Europa según Cervantes.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 13, 1916, No. 4, pp. 129-132. Real Soc. Geogr., Madrid. [Cervantes' last work "Trabajos de Persiles y Sigismunda" shows a careful study of the maps and geographies of the time.]

BLANCHARD, RAOUL. **The English fighting-ground in France and Flanders.** Maps. *Scribner's Mag.*, Vol. 62, 1917, No. 3, pp. 352-362.

BLINK, H. **Rassen, nationaliteiten, volken, en staten in Europa.** Map. *Vragen van den Dag*, Vol. 32, 1917, No. 3, pp. 236-249; No. 4, pp. 290-309; No. 5, pp. 337-363.

BONACCI, GIULIANO. **La seconda fase della grande guerra: Nel Medio Oriente attraverso il ponte balcanico.** Map. *Riv. Colon.*, Vol. 11, 1916, No. 1, pp. 17-34; No. 2, pp. 89-113.

BOSWELL, A. B. **The Polish question.** *Scientia*, No. 66, Vol. 22, 1917, pp. 294-302. Bologna.

BOSWELL, A. B. **The racial geography of east central Europe.** *Geogr. Teacher*, No. 46, Vol. 8, 1916, Part 6, pp. 351-360.

CAILLAUD, F. R. DU. **De l'identité des races qui ont formé les nationalités britannique et française.** Reprinted from *Man*, No. 79, 1915, Sept., pp. 1-5.

COLE, G. A. J. **The groundwork of east central Europe.** *Geogr. Teacher*, N 46, Vol. 8, 1916, Part 6, pp. 340-350.

COLOMBI, EMILIO. **La concorrenza germanica ai porti latini.** *L'Esplorazione Commerc.*, Vol. 32, 1917, No. 4, pp. 102-106.

FRANKLIN, THOMAS, AND E. R. SHEARMUR. **Europe.** 44 pp.; maps. (Practical Geography Notebooks based upon the Atlas Geographies.) W. & A. K. Johnston, Ltd. London, [1916]. 4d. 10 x 7½.

GALLÉ, P. H. **Over het verband tusschen schommelingen in de sterkte van de Noordoostpassaat van den Atlantischen Oceaan en schommelingen in verschijnselen op hydrografisch en meteorologisch gebied in Europa.** *Diagr. Tijdschr. Kon. Nederl. Aardrijks. Genoot.*, Vol. 34, 1917, No. 1, pp. 38-53; No. 2, pp. 192-209.

GARGAS, SIGISMUND. **De sociale en economische toestand van het Koninkrijk Polen.** *Tijdschr. voor Econ. Geogr.*, Vol. 7, 1916, No. 7, pp. 376-385. The Hague.

GREGORY, J. W. **The mineral fields of the Franco-German borderlands.** *Map Scottish Geogr. Mag.*, Vol. 33, 1917, No. 8, pp. 358-363. [Review of Professor de Launay's "France-Allemagne—Problèmes Miniers-Munitions-Blocus-Après-guerre." The discussion is illustrated by figures from the reviewer's Presidential Address to the Geological Society of Glasgow, published in its *Transactions*, Vol. 16.]

GURNEY, A. E. **The population of the Polish commonwealth.** With a preface by Ludwik Janowski. 40 pp. Polish Information Committee, London, 1916. 6d. 8½ x 5½. [With a table giving the number of Poles in Poland as 20,000,000, with 3,000,000 in America and 1,000,000 in other countries.]

HAUSER, HENRI. **La guerre européenne et le problème colonial.** 111 pp. 3rd edit. Librairie Chapelot, Paris, 1915. 1 fr. 7 x 5½.

KEUNING, J. **Het oudste bericht over de westkust van Europa.** *Tijdschr. Kon. Nederl. Aardrijks. Genoot.*, Vol. 33, 1916, No. 1, pp. 30-56.

KULAKOWSKI, B. D. **Poland as a concrete factor in international politics.** *Journal of Race Devel.*, Vol. 8, 1917, No. 2, pp. 171-187.

LICHTENBERGER, HENRI AND ANDRÉ. **La guerre européenne et la question d'Alsace-Lorraine.** 132 pp. 4th edit. Librairie Chapelot, Paris, 1915. 1 fr. 7 x 5½.

MOLTKE, GRAF [H. K.] **Wanderbuch: Handschriftliche Aufzeichnungen aus dem Reisetagebuch.** 240 pp. Gebrüder Paetel Verlag, Berlin, 1913. Mk. 3. 8 x 5½ [Italy, Spain, France.]

MURATORE, DINO. **Corso pratico di geografia moderna per le scuole medie di 1° grado (tecniche-ginnasiali-complementari e commerciali).** Vol. I: *Geografia generale, L'Europa, L'Italia.* viii and 296 pp.; maps, diagrs., ills. Vol. II: *L'Europa in particolare.* xi and 336 pp.; maps, diagrs. Istituto Geografico de Agostini, Novara, [1914, 1915]. L. 1.80 each. 8½ x 6.

MUSONI, FRANCESCO. **Cause ed aspetti, specialmente geografici, dell'odierno conflitto europeo.** *Riv. Geogr. Italiana*, Vol. 24, 1917, No. 3-4, pp. 111-131.

FRANCE

JOINVILLE, PIERRE DE. **L'armateur Balguerie-Stuttenberg et son œuvre.** xxiii and 485 pp.; bibliogr., index. E. Champion, Paris, 1914. 10 x 6½.

A history of the economic changes in France from the pre-Revolutionary period to post-Napoleonic days is presented in this book under cover of the name of a Bordeaux trader and of his overseas undertakings. The work is important because it covers the transition period which preceded the era of intense industrial development in France.

The choice of Balguerie-Stuttenberg as a representative of the enterprising merchant class of his day was fortunate, to judge by the widely scattered activity of the man. Of more than passing interest are the details of his dealings with America, particularly with the West Indies. Later, with the decline of the West Indian trade, French traders turned to the United States, where a common feeling against the English added to the natural bond of sympathy between the two republics.

No better way of exhibiting the French overseas trade of a hundred years ago could have been devised than this painstaking and thorough study of a single man's activity. The student is given a glimpse of details which a generalized account cannot contain.

BLACHE, J. **Notes de morphologie glaciaire: Vallées d'Uriage et d'Allevard.** *Diagr. Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 3, pp. 285-295. Grenoble.

BLANCHARD, RAOUL. **Annecy: Esquisse de géographie urbaine.** Maps, ills., *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 4, pp. 369-463. Grenoble.

study in city geography based on the method employed in the similar study on Grenoble (see *Geogr. Rev.*, Vol. 3, 1917, pp. 243-244). The rarity of urban development in the Alps confers peculiar interest on the examples that exist as a result of unusually favorable combinations of physical and historical circumstances. The interrelation of these two factors has created an especially edifying case in Annecy, "the pearl of the French Alps."']

BLANCHARD, RAOUL. **Le Haut Dauphiné à la fin du XVII^e siècle.** *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 3, 1915, No. 4, pp. 337-419. Grenoble.

BLANCHARD, RAOUL. **L'état actuel de l'industrie en Dauphiné (région de Grenoble).** *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 3, pp. 329-354. Grenoble.

BLANCHARD, RAOUL. **Le verrou glaciaire de Grenoble.** Ills. *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 2, pp. 237-257. Grenoble.

BLAYAC, J. **Contribution à l'étude du sol des landes de Gascogne.** Ills. *Ann. de Géogr.*, No. 133, Vol. 25, 1916, pp. 23-46.

BLIN, HENRI. **L'industrie résinière.** Ills. *La Nature*, No. 2229, 1916, June 17, pp. 385-389.

CLOUZOT, ÉTIENNE. **L'enneigement dans le Queyras aux XVII^e et XVIII^e siècles.** *La Géographie*, Vol. 31, 1916-17, No. 4, pp. 252-260. Paris. [Queyras is the upper valley of the Guil, a source of the Durance, in the Cottian Alps.]

COUSTET, ERNEST. **La nouvelle ligne ferrée de l'Estaque à Miramas (Marseille-les-Bains).** Ills. *La Nature*, No. 2211, 1916, Feb. 12, pp. 108-110. [See note in June, 1916, *Review* (Vol. 1, p. 459) on "Improvements in Internal Communication to the Port of Marseilles."']

COUSTET, ERNEST. **Le Rhône navigable et le tunnel du Rove.** Ills. *La Nature*, No. 2238, 1916, August 19, pp. 113-119.

COUSTET, ERNEST. **L'étang de Berre: Ses industries, son accès à la navigation maritime.** Maps, ills. *La Nature*, No. 2241, 1916, Sept. 9, pp. 161-166.

— **Dauphiné, Guide industriel du: Étude sur les ressources économiques de la région dauphinoise et sur leur utilisation au point de vue industriel et commercial.** 39 pp.; map. Chambre de Commerce de Grenoble, 1916. [Indicative of the industrial expansion in the Dauphiné due to the war, mainly based on its water-power resources. A map shows the distribution of hydro-electric plants in 1916 classified according to the form of power which they generate.]

DELABORDE, PIERRE. **Notes de géographie alpine (Embrunais, Ubaye, Tinée).** *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 3, 1915, No. 4, pp. 421-424. Grenoble.

DUFRÉNOY, J. **La mise en valeur des terres éventées en France.** Ills. *Rev. Gén. des Sci.*, Vol. 27, 1916, No. 15-16, pp. 472-478.

FLEURE, H. J. **France: A regional interpretation.** Maps. *Scottish Geogr. Mag.*, Vol. 32, 1916, No. 11, pp. 519-534. [Abstracted in the February, 1917, *Review*, Vol. 3, p. 150.]

FONCIN, MYRIEM. **La culture et le commerce des fleurs et primeurs sur la Côte d'Azur, de Toulon à Menton.** *Ann. de Géogr.*, No. 136, Vol. 25, 1916, pp. 241-262.

— **Marocain en France, Les impressions de voyage d'un.** *L'Afrique Française*, Vol. 76, 1916, No. 7, pp. 260-266.

AUSTRIA-HUNGARY

PFAUNDLER, RICHARD VON. **Das deutsche Sprachgebiet in Südungarn.** Map, ills. *Deutsche Erde*, Vol. 13, 1914-15, No. 1, pp. 15-22; No. 2, pp. 56-60; No. 6, pp. 159-171; No. 7, pp. 185-197.

REVELLI, PAOLO. **Il Carso.** Map, ills. *Riv. Mensile del Touring Club Italiano*, Vol. 22, 1916, No. 11, pp. 602-610. Milan.

REVELLI, PAOLO. **L'Isonzo.** Ills. *Riv. Mensile del Touring Club Italiano*, Vol. 23, 1917, No. 2, pp. 62-70. Milan.

VINASSA DE REGNY, PAOLO. **Cenni toponomastici sull'alta Carnia.** *La Geografia*, Vol. 4, 1916, No. 4-7, pp. 193-205. Novara.

DAINELLI, GIOTTO. **Carta della Dalmazia.** 1:500,000. Istituto Geografico De Agostini, Novara, 1916. With five insets: Caratteri naturali, 1:5,000,000; L'Adriatico e le sue coste, 1:4,000,000; Bocche di Cattaro, 1:200,000; Zara e dintorni, 1:75,000; Sebenico e dintorni, 1:200,000. [With text.]

ASIA

MALAY ARCHIPELAGO, INCLUDING THE PHILIPPINES

ABENDANON, E. C. De geomorphologische beteekenis der basische stolling gesteenten in het middendeel van den Ned.-Ind. Archipel. Map. *Tijdschr. Kon. Nederl. Aardrijks. Genoot.*, Vol. 33, 1916, No. 5, pp. 742-749.

ABENDANON, E. C. De oude beddingen der Beneden-Saädang-rivier. Map. *Tijdschr. Kon. Nederl. Aardrijks. Genoot.*, Vol. 33, 1916, No. 3, pp. 429-449. [Celebes]

BLINK, H. De opkomst en beteekenis van de rubber- en getah-pertja-productie en- handel in Nederlandsch Oost-Indië. Map. *Tijdschr. voor Econ. Geog.* Vol. 7, 1916, No. 5, pp. 196-209.

BORDAGE, EDMOND. Le repeuplement végétal et animal des îles Krakatoa depuis l'éruption de 1883; Appendice: Repeuplement végétal de Taal. *Ann. de Géog.* No. 133, Vol. 25, 1916, pp. 1-22.

BRAAK, C. Drachen-, Freiballon- und Fesselballon-beobachtungen. 58 pp. diags. *Kon. Magnetisch en Meteorol. Observatorium te Batavia Verhandelingen* No. Batavia, 1915.

CORONAS, JOSÉ. General weather notes. *Philippine Weather Bur. Monthly Bull.* 1915, November, pp. 233-251, maps; December, pp. 261-279, maps; 1916, January, pp. 35, maps; May, pp. 107-123, map; June, pp. 135-145; July, pp. 153-164, map; August, pp. 173-186, map; September, pp. 195-209, maps. Manila, 1916, 1917. [The big typhoon that crossed central Luzon at the beginning of November, 1915, was characterized by the extraordinary rate of progress of nearly 24 miles per hour. The *Bulletin* for January 1916, contains a report on the extraordinary floods occurring in Mindanao during the month.]

CORONAS, JOSÉ. Two typhoons in five days over Luzon: The typhoon of Ambo Camarines, October 22 to 28, 1915, and the typhoon of Aparri, October 23 to 31, 1915. 19 pp. Two more typhoons in seven days over Luzon, November 3 and 10, 1915. 9 pp. The typhoon of southern Luzon, December 4 to 9, 1915. 9 pp. maps, diags., ills. Reprint from *Philippine Weather Bur. Monthly Bull.*, Manila, 1916.

DEUSS, J. J. B. De theecultuur. 104 pp.; map, diags., ills. (Series: Onze Koloniale Landbouw, No. 6.) 2nd edit. H. D. Tjeenk Willink & Zoon, Haarlem, 1916. Fl. 1.50. 9 x 6.

EDWARDS, C. W. The live-stock industry of the Philippines. Ills. *Philippine Agric. Rev.*, Vol. 9, 1916, No. 2, pp. 136-149.

EDWARDS, H. T. The agricultural situation in the Philippine Islands. *Philippine Agric. Rev.*, Vol. 9, 1916, No. 2, pp. 60-73.

GALÁN, ANTONIO. The harmonic formula of Fourier and Bessel and its application to the study of the diurnal variation of the atmospheric pressure in Manila during the period 1890-1909. Prepared under the direction of José Algué. 71 pp. diags. *Philippine Weather Bur. Monthly Bull.*, Manila, 1914.

HALL, H. U. The Bagobo: Some notes on a lately acquired collection. Ills. [Univ. of Pennsylvania] *Museum Journ.*, Vol. 7, 1916, No. 3, pp. 182-194. [The Bagobos are a settled people numbering some ten or twelve thousand and occupying a mountainous section of Mindanao. An ethnographical collection pertaining to these people has lately been acquired by the Museum.]

— [Philippine] Weather Bureau, Annual report of the. Part I: Work of the Bureau during the calendar year 1914. Part II: Hourly meteorological observations made at the Central Observatory of Manila during the Calendar Year 1914. 140 pp. Manila, 1915.

WORLD AS A WHOLE AND LARGER PARTS

BROOKS, LEONARD. The Americas (New Regional Geographies, Book I). xiii and 238 pp.; maps, diags., ills., index. The Univ. of London Press, London, 1916. 3s. 8 x 5.

This first volume in a new series of regional geographies for secondary and high schools is somewhat of an advance over various others which have been published to serve a similar purpose, but it does not reach the ideal in all respects. The greater part of the book, 174 pages, is devoted to North America, with only some 55 pages devoted to South America. This perhaps is justified partly by the greater relative importance of the northern continent in general development and partly by the somewhat greater range of contrasts in North America than in South America. It nevertheless is true

at after reading the discussion of South America there is a feeling of incomplete treatment of some of the larger and more important aspects, such as the significance and development of the Argentine *pampa* and of the southern part of the Brazilian highland.

The general plan of treatment is to devote some preliminary pages to the larger aspects of the continent, such as the events leading up to the discovery, the major physical features, and the larger elements of climate. Following this general discussion, the detailed treatment is taken up by natural regions, as they are designated, although these differ in a good many ways from natural regions as outlined by other authors. Thus, in the United States, the Southern Appalachian region is made to include the coastal plain of the adjacent states; Florida is referred to as being a part of the Central plain, and so on.

Under each one of these natural areas the larger factors are discussed, particularly with reference to physiography, important climatic conditions where there are such, routes of communication as affected by natural factors, and the development of prominent industries and cities. Rather more space is given to the discussion of city development than is characteristic of most books written on this side of the Atlantic.

There is, perhaps, rather more of geological and purely physiographic aspects to the text than is altogether consistent with a geography of two continents—such as, for instance, an explanation of the development of river valleys and the processes involved in the building of the major mountains. On the other hand, there is rather less of emphasis on the strictly economic-commercial-social aspects of human affairs than might be wished for. A good many, some seventy or more, black-and-white maps and diagrams and a few half-tone illustrations supplement the text in a very satisfactory way. Some of these at least might very profitably be used with much more advanced discussion than is apparently intended in connection with this book.

Taken all in all, the volume is a decidedly successful attempt to set forth in a simple and brief fashion some of the most important aspects of the two Americas and might perhaps, with considerable profit, be used in high-school courses in this country, especially where there is time for work to supplement the ground covered by the text.

W. S. TOWER

— **Telephone and telegraph statistics of the world, January 1, 1914.** 6 pp. *Amer. Telephone and Telegraph Co. Bull. No. 4.* New York, 1915. [Abstracted in the August, 1917, *Review*, Vol. 4, pp. 148-149.]

WHYMAN, T. **The effect of geographical features on the war at sea.** *Journ. Manchester Geogr. Soc.*, Vol. 31, 1915, Pts. I-IV, pp. 19-22. [An address delivered to the Manchester Geographical Society on November 2, 1915.]

WILSON, RICHARD, edit. **Sons of the blood.** 64 pp.; maps, ills. (Dent's School Pamphlets, Senior, No. 3.) J. M. Dent & Sons, Ltd., London, Paris, and Toronto, [1916.]. 5½d. 7 x 5. [Economic geography of the British Empire, told in a simple and interesting way.]

WILSON, RICHARD, edit. **The staff of life.** 48 pp.; ills. (Dent's School Pamphlets, Intermediate, No. 3.) J. M. Dent & Sons, Ltd., London, Paris and Toronto, [1916.]. 4½d. 7 x 5. [Geography of wheat in the countries from which Britain draws her supply.]

ZÁRATE, R. DE. **El comercio español en América.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 13, 1916, No. 10, pp. 386-395. Real Soc. Geogr., Madrid.

— **Planisphère des fuseaux horaires dressé d'après les documents fournis par le Bureau des Longitudes.** [Mercator's projection; equatorial scale, 1:72,000,000.] Service Hydrographique de la Marine, Paris, 1917.

— **World, The: An atlas, containing thirty-four coloured maps with a complete index.** W. & A. K. Johnston, Ltd., Edinburgh, [1917?]. 12 x 7½. [Old style of maps with political coloring. Relief in insufficient hachuring in black.]

PHYSICAL GEOGRAPHY

METEOROLOGY AND CLIMATOLOGY

MCADIE, ALEXANDER. **The principles of aërography.** xii and 318 pp.; maps, diagrs., ills., index. Rand, McNally & Co., Chicago and New York, 1917. \$3.00. 8½ x 6.

This book is essentially a brief compilation of the most recent advances in meteorology. It is presented “. . . in a convenient form even if considerably condensed.” Unfortunately, however, in condensing the author has sacrificed clearness. The arrangement of the chapters makes it difficult to grasp the book as a whole; and the extensive use of direct quotation has further weakened the unity. While such lack of systematic handling

of the material probably will be a serious obstacle to the use of the book as a textbook still its value as a supplement to American textbooks in meteorology is assured by (1) the emphasis on recent developments, (2) the numerous quotations from important widely scattered sources, and (3) the commendable, consistent use of metric units of measurement and weight and of the absolute scales of Centigrade temperature and atmospheric pressure.

For students, however, the employment of such terms as 'aërography', 'kilobar', 'hyperbar and infrabar' to the exclusion of the corresponding accepted ones, 'meteorology', 'millibar', and 'centers of action' cannot be other than confusing. As an example of what misunderstandings may arise from scattered arrangement and inadequate explanations, the discussion of the temperatures of the upper air may be cited. On page 18 we read: "The lowest temperature thus far recorded in any country was obtained on an ascension at Batavia, Java, December 4, 1913, when, at a height of 17,000 meters, the beginning of the stratosphere in equatorial regions, the temperature fell to 181° (-91.9° C.; or -133° F.). In this ascent the balloon reached a height of 26,040 meters but above 17,000 meters the temperature rose steadily." On page 50: "In general the existence of the stratosphere is explained as due to radiation, Gold finding that above the isobaric level of 250 kilobars radiation has a heating effect, and below this, a cooling effect. . . . The theory indicates that if convection were absent and the absorption of solar radiation did not increase with height, the normal state would be one in which the gradient of temperature diminished gradually to a very small value." On page 28: "10° A. Effective temperature of space. At an elevation of 80 kilometers (50 miles) the temperature ranges from 5° to 10° A.,"—a temperature lower than that of space. In many other places, too much is left for the reader to assume.

The advanced student will find that the book is lacking in footnotes and bibliography but that the author offsets this with a wealth of tables computed only with difficulty and of illustrations and diagrams drawn from valuable, inaccessible sources. As a reference accompaniment to a well-ordered course in meteorology the book will probably be of greatest value.

C. F. BROOKS

CLARK, A. L. **Introduction to the study of cloud formations.** Ills. *Queen's Quart.*, Vol. 23, 1916, No. 3, pp. 248-260. Queen's University, Kingston, Ont.

DESLANDRES, H. **Influence des canonnades intenses et prolongées sur la chute de la pluie.** *Comptes Rendus Hebdomadaires des Séances de l'Acad. des Sci.*, Vol. 16, 1917, No. 17, pp. 613-615. Paris.

DOUGLAS, C. K. M. **On some causes of the formation of anticyclonic stratus as observed from aeroplanes.** Diagsr. *Proc. Royal Soc. of Edinburgh*, Vol. 37, 1916-17, Part II, pp. 137-148.

KASSATKIN, I. **Les mouvements verticaux de l'atmosphère.** 169 pp.; diagsr. Reprint from *Bull. Soc. Imp. des Naturalistes de Moscou*, 1914. [In Russian: summary in French.]

KEYES, C. R. **Competency of wind in land depletion.** *Monthly Weather Rev.* Vol. 45, 1917, No. 2, pp. 57-58. [A paper along the line of the author's studies in the past three years and similar papers under related titles in other journals. He argues for the great relative effect of wind as an agent of erosion.]

KINCER, J. B. **Daytime and night-time precipitation and their economic significance.** Maps, diagsr. *Monthly Weather Rev.*, Vol. 44, 1916, No. 11, pp. 628-633. [Abstracted in the April, 1917, *Review*, Vol. 3, pp. 327-328.]

LULOFS, H. J. **Aristoteles en Seneca over atmosferischen neerslag (Bijdrage over de physische geographie der Ouden).** *Tijdschr. Kon. Nederl. Aardrijksk. Genoot.*, Vol. 34, 1917, No. 1, pp. 79-99; No. 2, pp. 239-256.

MCADIE, ALEXANDER. **Aviation and aerography.** Diagsr. *Scientific American Suppl.*, No. 2161, Vol. 83, 1917, June 2, pp. 341-342.

MCADIE, ALEXANDER. **Forecasting the seasons: A subject of great importance in connection with planting and growth of crops.** Diagsr. *Scientific American Suppl.*, No. 2169, Vol. 84, 1917, July 28, pp. 50-51.

MARVIN, C. F. **Elementary notes on least squares, the theory of statistics and correlation, for meteorology and agriculture.** Diagsr., bibliogr. *Monthly Weather Rev.*, Vol. 44, 1916, No. 10, pp. 551-569.

— **Meteorology in war.** *Nature*, No. 2455, Vol. 98, 1916, Nov. 16, pp. 216-217.

REED, W. G. **Weather insurance.** *Monthly Weather Rev.*, Vol. 44, 1916, No. 10, pp. 575-580. [See the related article by the same author in the July, 1916, *Review*, and the note in the April, 1917, *Review*, p. 328.]

THE GEOGRAPHICAL REVIEW

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No. 3

POLYNESIAN NAVIGATORS: THEIR EXPLORATION AND SETTLEMENT OF THE PACIFIC

By **ELSDON BEST**

Dominion Museum, Wellington, New Zealand

[With separate map, Pl. I, facing p. 176.]

Apart from Indonesia and the off-shore islands extending northward to Japan and Sakhalin, the far-flung island system of the Pacific is usually divided into four ethnic areas, Micronesia, Melanesia, Polynesia, and Australia. The first of these embraces the Ladrões, the Carolines, and some adjacent groups, inhabited by people of apparently mixed origin but containing a small community of Polynesians at Monteverde, or Nukunoro, Island. The region of Melanesia lies between Micronesia and Australia, extending from the western extremity of New Guinea eastward to the Fiji group and including New Caledonia. These islands are occupied by dark-skinned peoples differing widely from the Polynesians, but isolated communities of Polynesians are found dwelling within the area. From the Fiji group eastward lie the innumerable isles of Polynesia, inhabited by a light-skinned folk described as white people by the early Spanish voyagers. This race has also peopled New Zealand and the Ellice group, thus leaving Fiji as a Melanesian projection into Polynesia. The adventurous Polynesians have settled as far north as the Hawaiian Islands, and their eastern outpost is lone Easter Island. The Australian area is confined to Australia, Tasmania, and a few isles near the Australian coast. Its native population is quite distinct from the peoples of Indonesia and other island regions and belongs to a lower culture stage; in no part do these aborigines practice agriculture.

It appears probable that the natives of Australia and Tasmania have occupied their area for a longer period than those of Melanesia have been in possession of the islands where we now find them. The Melanesians, who are by some writers divided into two ethnic groups, must, however, have

been settled in their present area for a very long period, considering the great number of languages that obtain in that region. The Polynesian appear to be the late comers of all these scattered peoples, and, if their traditions and some other factors be taken into account, they have been the most adventurous on the ocean and have traveled the farthest from their original habitat.

The origin of the Australian natives is an unsolved mystery. If ever they possessed any knowledge of constructing deep-sea vessels and of the art of navigation, then they have lost such knowledge with great completeness. The Melanesians we know as a non-adventurous folk, averse to long sea voyages, though constructing sea-going vessels in many cases. Thus the Tongans (Polynesians) adopted the Fijian (Melanesian) double canoe as being superior to their own, and made many voyages to the Fiji group, but Fijians never made the voyage to the Tonga Islands unless some Tongans accompanied them. If ever the Melanesians have been daring voyagers, then they have certainly lost that distinction for many centuries. The Micronesians appear to have excelled them as navigators and constructed remarkably swift sailing craft, the famous *prau*. It can, however, be shown that neither the Micronesians nor yet the Malay sea rovers of Indonesia possessed the energy, courage, and self-reliance of the Polynesians when it became a question of daring the unknown and lifting the long water trails of the vast Pacific.

As an illustration of the confidence and daring of Polynesians when abroad on the ocean, a paragraph in local New Zealand newspapers of February, 1917, is apt and also the most recent of instances. The natives of Piteairn Island, in eastern Polynesia, descendants of Tahitian women and mutineers of the *Bounty*, lately built and launched a schooner 44 feet in length. With a crew of fifteen she was sent on a thousand-mile voyage to Mangareva and Tahiti. She carried neither chronometer nor chart, but her crew sailed with a sublime faith in their ability to reach their destination and return safely to their little home island. When launched the vessel struck a rock and was leaking when she put to sea, but her crew counted on effecting repairs at some island during the voyage to Mangareva.

PREDECESSORS OF THE POLYNESIANS

In view of the evidence that the Polynesians were comparatively late comers in the Pacific, the question of prior inhabitants of that part of the island system known as Polynesia is of interest. Those who have studied the question of the origin of the Polynesians and of their original homeland, such as Judge Fornander and Mr. S. Percy Smith, seek to show that they came from southern Asia and that they reached the present Polynesian area early in the Christian era, about the fourth century. Is it possible that the great number of islands east of the Melanesian area was uninhabited at that period? It does not seem probable, when we consider the evidence of drift

voyages, not to speak of the antiquity of the human race. These unlettered peoples have preserved but little evidence to be scanned and seem to possess no clear tradition as to former inhabitants. The most remarkable is that of the natives of Easter Island, a legend which states that, when their ancestors reached that lone isle many generations ago, they found it peopled by a strange "long-eared" folk, who were destroyed in after days. These "Long Ears" are supposed to have been the people who employed the peculiar script found incised on wooden tablets, a curious series of symbolic or hieroglyphic characters found nowhere but at Easter Island and apparently arranged or written in a boustrophedon manner. There is no evidence to show that the Polynesians ever possessed any form of script or had any knowledge of metals. The so-called translations of the Easter Island inscriptions are open to grave doubt.

Among various branches of the Polynesian race exist traditions of an old-time people called Manahune, who appear to have occupied an inferior position. It is just possible that these Manahune were a survival of a pre-Polynesian folk, but there is little evidence to go upon.

At the same time it is but just to state that we are very slow to acquire knowledge of past events in the history of native peoples, albeit such natives may possess fairly clear traditions on the subject. For many years it was believed that New Zealand was an uninhabited land prior to the arrival of a considerable number of Polynesian immigrants some twenty generations ago. Further inquiries, spread over many years, led to the publishing of many traditions concerning the coming of a previous company of Polynesian settlers some eight to ten generations before the advent of the above-mentioned immigrants. Again, it is but a few years ago that traditions existed among East Coast natives that, when the first Polynesian settlers arrived on these shores, they found a strange folk of inferior culture in occupation there. These original settlers may have been Melanesians, but it is generally thought that they were a mixed race caused by the intermingling of Polynesians and Melanesians. The traditions concerning them are dim with age.

It is just possible that further information on the peopling of Polynesia may yet be obtained. Meanwhile, if we are to accept the above-mentioned date as to the arrival of the Polynesians in the Eastern Pacific area, then we must assuredly regard statements to the effect of their being the first inhabitants of that area with considerable doubt.

Traditional Origin of the Polynesians

HAWAII

Apart from traditions of local movements, settlings, resettlings, and hiving-off migrations, the various branches of the Polynesian race maintain that their remote ancestors dwelt in an extensive land lying far to the westward. From this land they migrated to the eastward, eventually reach-

ing the islands where they now abide. It is a noteworthy fact that these islanders all locate the spirit land in the west; in fact the spirit world and the original homeland of the race are apparently confused and are often spoken of as though one and the same place. This is specially noticeable in the lore of the Maori of New Zealand, who speak of the ancient homeland as Hawaiki. The inner teachings, however, of former priestly adepts disclose the fact that Hawaiki was not the name of the fatherland but of a sacred place there to which all spirits of the dead proceed on the death of the physical basis, the body. From that central place such spirits separate and go to two different spirit worlds. The spirits of those who sympathize with the Earth Mother descend to Rarohenga, the subterranean spirit world; while those whose sympathies are with the Sky Parent, Rangi, ascend by means of the whirlwind to the upper spirit world. Such sympathies are connected with the violent separation of these primal parents in the days when the world was young, when they were forced asunder by their rebellious offspring.

So strong a hold had this name of Hawaiki on the imagination of the Polynesian that he carried it with him in his wanderings athwart the Pacific and applied it to many islands, and it is found in various forms, according to dialect, as Hawaiki, Hawaii, Avaiki, Savaii, etc., from the Hawaiian Islands to New Zealand. Both Raiatea and Tahiti seem to have been known as Hawaiki in former times, while New Zealand was known to the natives of south-central Polynesia as Hawaiki-tahutahu.

IRIHIA

According to traditions preserved by the Takitumu clans of the Maori folk of New Zealand, the original homeland of the race was a great land named Uru. From this land the ancestors of the Maori migrated to another land named Irihia, situated eastward of Uru. Irihia had a remarkably hot climate and was inhabited apparently by several different races, among whom a very dark-skinned people were remarkably numerous. A famous vegetable food of that land was called *ari*. As to what land this was we can only conjecture, but it is of interest to note that an old Sanskrit name for India was Vrihia (possibly connected with Sanskrit *vrihi*, rice), which any Polynesian would certainly pronounce as Irihia.

EASTWARD WANDERINGS

There is no means of determining the length of the Polynesian sojourn in Irihia, or rather of the people whose descendants became Polynesians. Tradition states that they became involved in war with dark-skinned aborigines and suffered so grievously that they, or a portion of them, left Irihia and sought a new home across the ocean. They steered toward the east, guided by the heavenly bodies during the day and by the stars or the cool, damp sea breeze at night. Eleven days' voyage brought them to a land called by them Tawhiti-roa. Here they appear to have dwelt for some

time, until wars again forced them to take to the ocean. Sailing to the eastward they reached another land, known to the Maori as Tawhiti-nui, an extensive land, where they went up a great river and settled on its banks. This sojourn is said to have been a long one. Here they became a numerous people, but, apparently, war again caused them, or some of them, to seek the sea roads in later days. In the time of Ira-panga they came, ever seeking the rising sun, and no further halts are mentioned, though probably they called at many isles, until they arrived at the islands of Ahu, Maui, and Hawaiki. Mr. Percy Smith identifies these isles with those of (O)ahu, Maui, and Hawaii of the Hawaiian group, but it is well to note that the same names occur in the Society group, where several small islets are called Maui, while Hawaiki seems to have been an old name for Tahiti. As for Ahu, we are told in Maori tradition that Ahu, Ahuahua, and Tuhua were all names applied to the one island, identified with Maitea Island, east of Tahiti.

Wherever the ancestors of the Polynesians may have originally dwelt, it is clear, from many traditions of widely separated branches of the race, that they came from the west. The Polynesian communities met with in Melanesia and Micronesia may have been left behind by the original migrants or they may represent a backwash from Polynesia, the result of drift voyages.

The Vessels of the Voyagers

METHOD OF CONSTRUCTION

A curious and interesting passage in the old tradition of the migration from the land of Irihia describes the manipulation of the vessels at sea and the procedure adopted on the approach of rough weather. Not only is the use of sea anchors and an awning or covering for the long boats mentioned, but also the use of the double outrigger seems to be alluded to, and, what is most singular, these seem to have been carried inboard in calm weather and only fixed on the approach of a storm. This seems a somewhat improbable procedure, and there exist no means of verifying the statement.

We are told that the migrants always steered in general toward the rising sun, but that small parties occasionally broke off and pursued other courses.

After the arrival of these wanderers in the central and eastern areas of the Pacific Ocean, they evidently still followed their roving habits and became probably the most amazing deep-sea voyagers the world has ever known. In order to grasp this fact two important matters must be remembered: In the first place, these voyagers had no knowledge of the compass and its uses; and, secondly, their ignorance of the use of metals was another serious handicap in the construction of vessels. The vessels employed were of two kinds, the double canoe and the outrigger canoe. This term canoe is somewhat of a misnomer and, to some extent, misleading. The Polynesian

vessel resembled the prau of Indonesia and the Caroline group but differed somewhat in form. Generally speaking, their construction may be described as a dugout hull with one or more top-strakes added to its side. The work was done with stone tools, and the craft were carvel-built. In some cases, where timber was scarce or trees were of small size, the dugout hull was only a shallow trough, the sides being built up of several tiers of planks, sometimes of short length, demanding much careful labor in join-



FIG. 1—*Waka taua*, or Maori war canoe. (From an old Dutch cut copied from Pl. 16 of John Hawkesworth's "An Account of the Voyages Undertaken . . . for Making Discoveries in the Southern Hemisphere . . . by Commodore Byron, Captain Wallis, Captain Carteret, and Captain Cook," 3 vols., London, 1773.)

ing. In islands providing large-sized trees, dugout hulls of great length and considerable depth, requiring but one top-strake, were made, as we see in New Zealand. When a hull needed lengthening, an additional piece, or pieces, was hewn out and lashed on, in which case rigidity was imparted to the hull by means of carefully fitted and secured top-strakes.

DIFFERENT FORMS

The range of the outrigger is a matter of some interest and may point to a distribution from the vicinity of southeastern Asia. It is found on the coast of India and eastward across the Pacific Ocean to the far-off isles of eastern Polynesia. It is also in use on a stretch of the east coast of Africa, and its use there may possibly be owing to the same cause that introduced the Polynesian numerals into Madagascar. Elsewhere in Africa it is not used, neither was it known in America.

Both the single and double outriggers are found in the Pacific area, the former predominating, it being the common Polynesian type. The Polynesian voyagers employed both the double canoe and the outrigger, and we have evidence that both forms were introduced in New Zealand. In these

islands, however, both forms fell gradually into disuse. Tasman seems to have seen only the double canoe on New Zealand shores in 1642, but when Captain Cook arrived there, in 1769, he found that a change had taken place. He saw but one double canoe on the coasts of the North Island, but a considerable number at the South Island, while but few outriggers were seen. It was probably owing to the large size of the timber trees in the islands, and to the fact that the Maori of New Zealand had given up deep

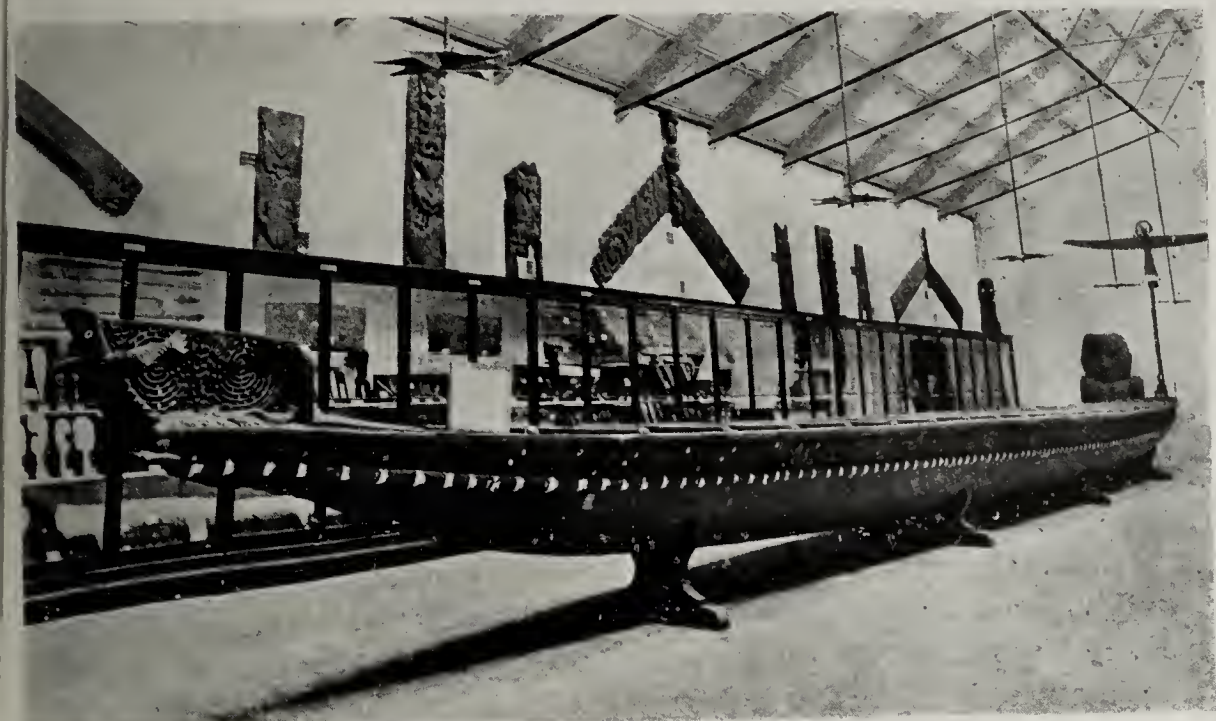


FIG. 2—A Maori canoe named *Te Toki-a-tapiri* (Auckland, N. Z., Museum). Length, 83 feet; beam, 7 feet. The hull is hewn out of one log, save the small headpiece. The join of the top-strake and hull is covered with battens. The top-strake is elaborately carved.

ocean voyages, that the single canoe, without any outrigger, became the common Maori form of vessel. In this new form of vessel, one of wider beam than the Polynesian outrigger, the Maori performed his coasting voyages round the shores of these islands, where the seas are by no means remarkable for smoothness. As an illustration of the proportions of these vessels, we may give those of a fine specimen named *Te Toki-a-tapiri*, now in the Auckland Museum (Fig. 2). The length of this vessel is eighty-three feet, and beam seven feet. It seems probable that many of the vessels in which the ancestors of the Maori reached New Zealand were not so long as the above.

SAILS AND RIGGING

The Polynesian voyager employed both sails and paddles, some vessels being provided with two masts. The common form of sail was a lofty triangular one, set with the narrow end downward, as seen in the plates of the works of early European explorers in these seas. The lateen sail was used on the big double canoes of Tonga and some other western groups; there is also some evidence to show that it was formerly employed in New Zealand,

under the name of *ra kaupaparu*. The upright form, *ra kautu*, was also used there, and was, apparently, the only form seen by early settlers.

The single canoe of Polynesia is a quick sailer and less cumbrous than the double canoe; it seems to have been more favored by voyagers in some cases, though the Tongans made their remarkable voyages to Melanesia in a big type of double canoe traceable to a Fijian origin. The Fijians, a Melanesian folk, constructed fine vessels, but made no voyages outside their own groups, save as companions of Polynesian voyagers.

Our Polynesian navigator is said to have made his deep-sea voyages in open canoes, but there is clear reference in Maori tradition to the covering of vessels at sea on the approach of bad weather. This covering consisted of a sort of awning called a *mahau*, the frame of which was rapidly erected when necessary. Upright stanchions were lashed to the thwarts on both sides of the hull; curved transverse rods, lashed to each brace of uprights, supported longitudinal battens; and over all were drawn mats, which were stretched taut and lashed down at the sides.

Cook remarks that some of the New Zealand canoes would carry sixty, eighty, or one hundred people. Cruise saw a fleet of fifty of these in 1820, many of which were seventy to eighty feet long, and few less than sixty. He also mentions one eighty-four feet long, six feet wide, and five feet deep, made from a single log. With ninety paddlers and three foglemen she moved with astonishing rapidity, causing the water to foam on either side.

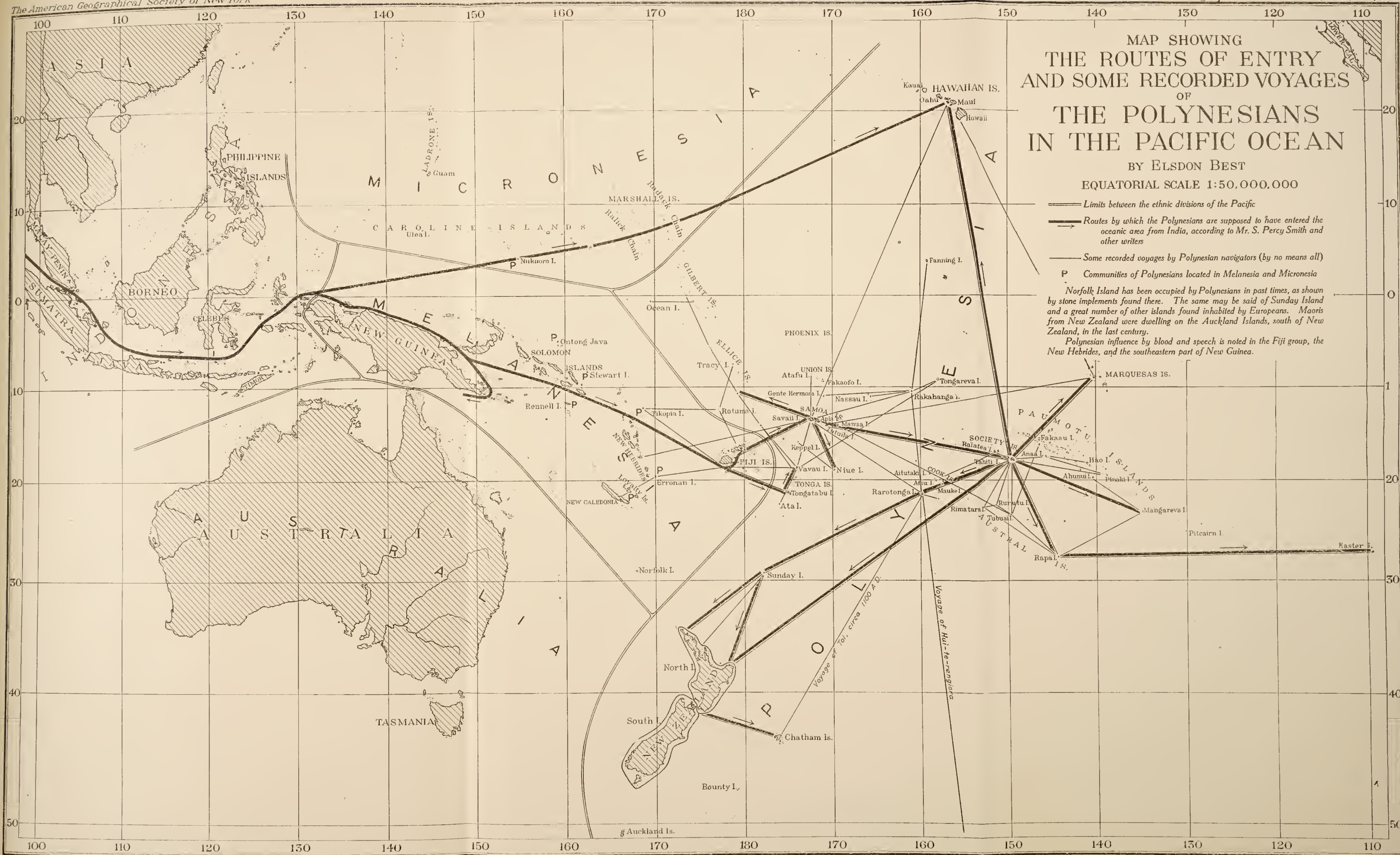
Many Tongan double canoes were one hundred feet long and carried a huge lateen sail, while the deck supported a house or cabin. The *pahi*, a big double canoe, was much used for ocean navigation in the Cook, Society, and Paumotu groups. Cook saw a fleet of one hundred and sixty large double canoes at Tahiti, besides one hundred and seventy smaller ones. At Samoa the larger hull of a double canoe was sometimes considerably over a hundred feet in length. Polynesian canoes and their construction comprise a subject of much interest, albeit we have no space to discuss them further.

The Peopling of the Many-Isled Sea

AUDACIOUS VOYAGERS

Let us now consider briefly the feats of Polynesian navigators, of the sturdy Neolithic sea rovers, who, as they quaintly put it, broke through the hanging sky, and explored the vast area of the Pacific Ocean, who rode boldly out on the far-reaching *ara moana*, or sea roads, in quest of new lands, who crosshatched the heaving breast of Hine-moana¹ with the wake of their lean prau. Long centuries before Columbus and his timid crews erept fearfully across the Western Ocean, the Polynesian was making voyages of thousands of miles in rude open vessels on seas unknown to Europeans. He did not waste time and weaken his resolution by fearing unseen dangers, or by whining to his gods to keep him from falling over the

¹ Personified form of the ocean in Maori myth.



edge of the world, for he firmly believed his gods to be on his side and ever upholding him. Gripping his long steering oar and trimming his lofty sails, he threw the racing leagues astern and boldly sailed down into unknown seas in search of adventure or a new home. Ignorant of the compass and of charts, he held his prow on the heavenly bodies or followed the regular roll of the waves before the trade winds. From the far-flung Carolines to the lone outpost of Easter Island, from Hawaii in the north to New Zealand in the south, across seven thousand miles of the ocean the Polynesian lifted the rolling water trails of the Pacific. Ever yielding to the lure of Hine-moana, urged on by the spirit of adventure, he drove his long boat across many lines of longitude through many degrees of the thermal line.

The peopling of the eastern Pacific by the Polynesians has been brought about in two ways, namely, by voyages duly planned and by drift voyages. We have much evidence to show that, in former times, the Polynesians made many voyages of exploration, during which many islands were settled and resettled by them. We have also knowledge of a great many cases of drift voyages in many directions, and tradition tells us that the first peopling of New Zealand was due to such a voyage. Drift voyages were generally due to the winds, sometimes to fog, while ocean currents have also played their part.

Cook tells us that he found the Polynesians occupying an area measuring twelve hundred leagues from north to south and sixteen hundred leagues east and west, but outside those bounds exist certain Polynesian communities in Melanesia and Micronesia. Some of the set voyages made within this area, as also others that extended outside of it, will now be considered.

VOYAGES TO NEW ZEALAND

When we think of the number of long voyages made by Polynesians with but a small area of land as an objective point, we must acknowledge them to be bold and skillful navigators. Such voyages as those from Hawaii to Tahiti and from Tahiti to New Zealand called for the navigation of long distances broken by few or no havens of rest, when a considerable supply of stores would have to be carried and great care displayed in keeping the course. In the voyage from Tahiti to New Zealand, of which many have been made, the navigators ran down to Rarotonga in the Cook group and from there launched out on the run of about 1,600 miles to New Zealand. This voyage was made in December, when the wind was favorable; the return voyage being made in June. This long run would probably occupy about a fortnight, but might have been done in less time with a steady wind. On this voyage vessels sometimes called at Sunday Island, which is 600 miles from New Zealand; but so small an island must, one would imagine, have been often missed. Two explorers named Kupe and Ngahue, from the Society group, are said to have discovered New Zealand, which was then

uninhabited. Thirty generations ago another Polynesian voyager, named Toi, reached these isles and found much of the North Island occupied by a dark-skinned folk of a culture inferior to that of the Polynesians, perhaps a mixed Polynesian-Melanesian breed. These were the descendants of the crews of three canoes that had been driven from their home land by a westerly storm to be cast on these shores. An interesting feature in the voyage of Toi is the fact that, in sailing southwest from Rarotonga, he kept too far east and missed the North Island, but discovered the Chatham Islands, then uninhabited. By ranging westward he reached New Zealand, and a number of return voyages from here are also recorded in tradition. A Polynesian voyager named Nuku brought a party of adventurers to these isles about twenty-eight generations ago in two double canoes and one outrigger vessel. In order to expedite his return to Polynesia he dismantled his double canoes and transformed them into outrigger vessels. The last recorded voyages from New Zealand to Polynesia occurred ten generations ago.

MARQUESANS AND HAWAIIANS

Porter, an American voyager, collected some interesting notes early in the last century of voyages made by natives of the Marquesas group. He tells how the grandfather of a reigning chief sailed, with several families, in four large canoes in search of other lands, taking with him hogs, poultry, and young food plants. In this manner have the breadfruit, coconut, banana, yam, sweet potato, taro, etc., been distributed over the oceanic area. Most of these food-producing trees and plants are traceable to a western source, as also the *aute*, or paper mulberry, but the sweet potato and coconut are thought by some to have originated in America.

Fornander tells us that, in former times, the Marquesans voyaged to the Hawaiian group and made many voyages westward from their own isles, some of them in search of a traditional fatherland supposed to lie in that direction.

Fornander and Ellis both tell of voyages made by the Hawaiians to the Marquesas and Society groups, one Hawaiian navigator making no less than four voyages to Tahiti, some 2,800 miles distant. Hawaiian traditions describe how these seafarers steered by the stars, how an old-time voyager reached a far land peopled by a slant-eyed folk and brought two white men back with him. Marquesans told Quiros of far-distant lands inhabited by black folk who fought with the bow and arrow, an implement never used in war by Polynesians.

SAMOANS

The Samoan voyagers of yore seem to have ranged far and wide across the Pacific, and oral traditions tell us of their voyages to the Hawaiian, Marquesas, Society, Cook, Tonga, Paumotu, and Fiji groups, also to many isolated isles. As an illustration of such voyages of adventure and exploration we particularize one made by Uenga, a Samoan navigator of the twelfth

century, omitting two stages of the voyage not clearly explained. Uenga sailed from Savaii to Tonga (480 miles south-southeast) and thence to Vavau (150 miles north-northeast). From here he was swept by a storm to some unnamed island, whence he sailed to Tongareva (900 miles northeast of Savaii), from which place he went to Rimatara (780 miles south-southeast), thence to Rurutu (70 miles east-northeast), thence to Tubuai (120 miles southeast), and thence to Fakaau in the Paumotu (480 miles north-northeast). After voyaging through this far-spread archipelago he went to Tahiti, from which place he worked his way homeward to the Samoan group.

Some of the early Samoan settlers came from Atafu in the Union group, and Rarotonga was settled in early times by Samoans. When Toi sailed from the Society group, he went to Pangopango on Tutuila (Samoa Islands), thence to Rarotonga, thence to New Zealand. Maru and Te Arutanga-nuku, two other famed explorers, made many voyages. Tangihia reached Niue, Keppel Island, the Marquesas, Tahiti, Mauke, Rapa, Rurutu, Rimatara, and other islands. Whiro was another famed sea stroller who reached many lands, as also did Tutapu. Rarotongan traditions tell us of the amazing voyage of one Hui-te-rangiora, who sailed southward until he encountered icebergs and frozen seas, described as resembling a vast extent of *pia* (prepared arrowroot).

The traditions of Rarotonga also tell us of a fleet of thirteen vessels that reached that island from the far eastern isles of Polynesia some twenty generations ago. Five of these vessels remained at Rarotonga, their crews settling there, while the other eight sailed in search of other lands. The names of all these vessels have been preserved at Rarotonga. From Maori traditions of New Zealand we know that six of them reached its shores, but the other two have not been traced. Curiously enough the natives of the Cook group state that they are partially descended from immigrants from New Zealand.

TONGANS

Of Tongan navigators much might be written, for these folk seem to have continued making long voyages down to the time of European intrusion. Sterndale, a close observer, tells us that, had the Tongans possessed metal tools, they would have subdued all Polynesia:—"Their immense war canoes, at least a hundred feet long, rigged with a lateen yard, were miracles of patient ingenuity, and needed indomitable daring for their navigation." The Tongan invasion of Fiji is a well-known fact, but the advent of Europeans stayed their rapidly increasing power in that group. Tongan raiders made voyages westward to the New Hebrides and Loyalty Islands, to Tikopia and New Caledonia. Labillardière speaks of seeing one of their vessels off the coast of the latter island.

DRIFT VOYAGES

The effects of involuntary drift voyages are often far-reaching. We

have seen that drift canoes gave New Zealand its first inhabitants. It was a drift voyage that brought Toi and his companions thither, for they were in search of one Whatonga and others who had been driven from their home island by a storm. There are two traditions of drift vessels from New Zealand reaching Polynesia in later times. Cook found castaways from Tahiti on Atiu Island, of the Cook group. In 1721 two canoes reached Guam after a drift voyage of twenty days. In 1817 Kotzebue found at an island of the Radaek Chain a native of Ulea, of the Caroline group, from which place, with three companions, he had made a drift voyage of 1,500 miles. Again, Kotzebue encountered a Japanese vessel off the California coast in 1815 that had drifted for seventeen months across the North Pacific. The Japan Current has carried a number of such vessels to the coast of British Columbia, and one such was wrecked at the Hawaiian Islands.

In 1844 a whaleboat drifted from Anaa Island, east of Tahiti, to the Samoan group in forty days. Of the crew, three natives and a white man, only the latter survived. In 1862 sixty natives drifted from Fakaofu to Samoa, 300 miles. The missionary Williams drifted 1,200 miles from Rarotonga to Tongatapu through the influence of the trade winds; this in his "home-made" boat. On another occasion he drifted from Tahiti to Aitutaki, in the Cook group. One of his boats, running from Tahiti to Raiatea, was blown out of its course and, after a six weeks' drift, reached Atiu. Dillon tells of a drift canoe from Rotuma reaching Tikopia, about 465 miles, a minor drift.

In 1832 Williams found at Manua, in the Samoan group, a native of Tnbuai, far south of the Society Islands. His party had been three months drifting from one isle to the other. Some natives of Aitutaki drifted to Proby's Island, 1,000 miles to the westward. In many of these cases of drift voyages rain water and fish were the salvation of the ocean waifs, in many others dreadful hardships were endured, and no doubt many such parties have perished to a man. Strong winds and a cloudy sky have been the cause of many weary drift voyages, but the worst combination was a fog and a change of wind; this left the hapless voyager utterly helpless.

The missionary Threkeld reported that, on March 8, 1821, a canoe from Rurutu, of the Anstral group, reached Raiatea after a three weeks' drift and dire suffering among its crew. Pritchard mentions a community in the Loyalty group who are descendants of castaways from Tonga, over 1,100 miles away.

THE LESSON OF THESE VOYAGES

Many similar cases of drift voyages are known in tradition, and many have been vouched for by reliable Europeans. The lesson we may learn from all these voyages of exploration and adventure, of forced migrations of defeated tribes, of drift voyages, is the manner in which the isles of the Pacific were settled by man. Quiros, one of the earliest European voyagers in the Pacific, held that a great motherland must exist in the south, "as

otherwise the islands could not have been populated without a miracle." Other writers, down to the present time, have proved to their own satisfaction that the Polynesians could not possibly have made such voyages as we have mentioned above, that they could not have reached New Zealand from Tahiti in "frail canoes" by their crude methods of navigation. In this case the fact that the Maori language is spoken from New Zealand northward to Hawaii, from Easter Island westward to the Tongan group, as also in isolated places in Melanesia and the far-away Carolines, must be the miracle mentioned by Quiros. As to frail vessels, the top-straked dugout, outrigger or double, was a stronger craft than the ship's boat in which Bligh and his companions made their amazing 4,000-mile voyage from Tonga to Timor in forty-one days.

THE TRUE ARGONAUTS

A glance at the accompanying map (Pl. I) shows us that our Polynesian navigators have crosshatched the eastern Pacific with their voyagings, while their influence, blood, and speech are noted as far west as the Solomon Islands and New Guinea. To such a bold race of seafarers what difficulties would be presented by a voyage through the close-lying isles of Indonesia? Of a verity, could we but write the history of our Polynesian navigators, our Maori buccaneers, it would be a wonder story for all time, and coast-creeping Argonauts of yore would lose caste. For the true Argonauts are here, here in the sunlit isles of Polynesia. But we cannot grasp these facts, and, moreover, we do not like them. Because we crept alongshore for long centuries, and feared to lose sight of land, we object to the idea that the Polynesian made long ocean voyages in pre-compass days. Our Polynesian voyager stoutly maintains that he sailed his pran across the rolling realm of Hine-moana whenever he felt like it, but our wise men say that he did no such a thing, that a miracle occurred, or that the earth sank under him, leaving him clinging desperately to the mountain peaks we call the isles of Polynesia. "There is," quoth the late Mr. Billings, "a deal of human nature in man."

Ask one of my Maori friends how his ancestors managed to reach New Zealand from eastern Polynesia in their Neolithic dugouts, lacking scientific instruments. He will, with serious mien, tell you that the gods assisted them, guided them across the great ocean, watched over them as they rode out the ocean gale to the stone sea anchor, protected them from all dangers of the deep. He will recite to you the sacred ritual by which the aid of the gods was invoked and explain wondrous talismans that were the salvation of the life principle, physical and spiritual. He will tell you how Kahu-kura, the rainbow god, acted as pilot; how Hine-korako (lunar halo personified) guided them; how Ruamano, the sea monster, led the way.

But, sayeth the intelligent reader—and all our readers are intelligent—this is nonsense, this is primitive superstition, these gods and demons are

mythical and exist only in the imagination of savages. Friend! all gods exist, all gods are true, all gods are helpful, for just so long as they are believed in. The Polynesian ranged the Pacific Ocean because he believed that his gods were upholding him in all such ventures. As for us, we looked askance at the ocean and peopled distant lands with dread demons, holding it as impious to quit the beaten path. Our gods were not with us. All along the life story of man, throughout the changing ages and round the rolling earth, superstition has been, and is, a mighty power. But it works in different ways.

The day of the Polynesian voyager has passed, and nevermore will the sea roads know him. Never again will he watch the foaming water walls on either side of his flying prau, never again hold her figurehead to a gleaming planet, or listen on darkling waters for the long-drawn thunder of the ocean surge on the guardian reef.

But, in days that lie before, men will tell how the brown-skinned sea rovers sailed to and fro athwart the vast Pacific, how they traced out the sea roads with the courage of gods and the ignorance of the Neolith; and how the men of later times followed those rolling waterways. For, as the sea singer has writ—

Though no man marked a passage,
Though no man blazed the trees,
That other feet might follow
His footsteps on the seas,
Though no man lit the camp fire,
Or carried staff and chain,
The pathways of the waters
Were ever placed and plain.

Even then will it be recognized that these old Pacific vikings were the true Argonauts and sea-conquerors of old, the men who sought and knew the ways of many waters, the splendid water roads.

For, circled by the sunrise,
And spread beyond his set,
The breezy roads and bonny
Are rolling bravely yet!
Beneath the grand expanses
Of guiding, starlit sky
The tracks the rovers traveled
Still wide, unbounded, lie.

And till old Gabriel's trumpet
Shall echo overhead,
And from their place of biding
Come up the wakened dead,
Till lost ships all deliver
Their long-forgotten loads,
Still will they shine and sparkle
The splendid water roads!

NOTES ON MACMILLAN'S ELLESMERE ISLAND TRIP

Prior to the return of the Crocker Land Expedition last fall, Donald B. MacMillan, the leader, made an exploratory trip along the southeastern coast of Ellesmere Island, the large island of the American Arctic Archipelago bordering on the west the channel between it and Greenland which leads into the Polar Sea. This trip has already been described in the October, 1917, *Review* (Vol. 4, pp. 320-321). Additional details have been furnished the Society by Mr. MacMillan, which, together with photographs taken on the trip, are presented herewith.

Leaving Etah on the Greenland coast on March 27, 1917, MacMillan with three Eskimos crossed Smith Sound in a northwestern direction and then followed the coast of Ellesmere Island south until blocked by open water and an impassable ice-foot at Cape Isabella (in the same latitude as Etah).¹ This was one of the points where cairns were erected by the British Arctic Expedition of 1875-76 under command of Captain (later Sir) George S. Nares. On the outward trip, on July 29, 1875, a cairn was built here and a cask left to receive letters for the expedition.² Contact with the outer world was established through Captain (later Sir) Allen Young's voyages in the *Pandora* (later De Long's *Jeannette*).³ On his attempted trip to the north magnetic pole in 1875 he made two visits to the Cary Islands (in the approach to Smith Sound), leaving mail for the expedition on August 18 and finding despatches from it on September 10.⁴ On his second trip, in 1876 (on August 6), he landed at Cape Isabella. The circumstances connected with the depositing of despatches for the Nares expedition are here set forth editorially in order to allow the reader to assign to a find which MacMillan made at Cape Isabella its proper place among the intricacies of these Arctic *malentendus*.

On August 3, three days before, Captain Young had visited Littleton Island, on the opposite side of Smith Sound, and found a record signed by Nares and dated July 28, 1875, in which the following passages occurred:⁵

Should this cairn not be visited by a sledge party from the expedition before June,

¹ For location of places see the map in the Geographical Record under "Polar Regions." below.

² See G. S. Nares: *Narrative of a Voyage to the Polar Sea during 1875-6 in H. M. Ships 'Alert' and 'Discovery'*, 2 vols., London, 4th edit., 1878; reference in Vol. 1, pp. 56-57. The passage reads: "Commander Markham accompanied by Captain Feilden landed in a small bay on the south side of the extreme point of the cape. After an extremely rough scramble up one of the gullies, a cairn was erected on the outer spur of Cape Isabella, 700 feet above the water-line; a cask for letters and a few cases of preserved meat being hidden away on a lower point, about 300 feet high, magnetic west of the cairn."

Cf. also: *Journal and Proceedings of the Arctic Expedition, 1875-6, under the Command of Captain Sir George S. Nares, R.N., K.C.B.*, *British Parliamentary Paper C 1636*, London, 1877, p. 4.

³ Allen Young: *The Two Voyages of the 'Pandora' in 1875-76*, London, 1879. The relevant passages are on pp. 32-33, 70-71, 83-84, 125-126, and 132-150. In the following account *Parliamentary Paper C 1636* is followed.

⁴ Young, *op. cit.*, pp. 32-33 and 70-71 and *Parliamentary Paper C 1636*, p. 470.

⁵ *Parliamentary Paper C 1636*, p. 478.





FIG. 2—Approaching from the south a depression on the landward side of Cape Isabella.



FIG. 3.



FIG. 4.

FIG. 3—Camp on the sea ice about twenty-five miles south of Cape Isabella. The coast is visible in the distance.

FIG. 4—Camp at Cape Isabella.



FIG. 5.



FIG. 6.

FIG. 5—Brevoort Island from Peary's hut at Cape Sabine.
FIG. 6—Ice-foot near Cape Sabine.

1876, our despatches will be found near a cairn on Cape Isabella; but if the strait is easily crossed, the sledge will visit this position.

Should any letters for us be brought thus far I request that they may be brought on as far north as the vessel intends to come on the west side of the strait. If the vessel is not to enter the strait, then I request that our letters may be placed in my cairn on Cape Isabella. . . .

My intended stations on the west shore of the strait, where cairns may be expected to be found, and which will be regularly visited as long as the expedition remains north of Smith Sound, are Cape Isabella, Island off Cape Sabine, Dobbin Bay, or Cape Leidy, Carl Ritter Bay, and Cape Bellot.

In view of the ice-filled condition of Smith Sound and the relatively early date, Captain Young could not tell what his movements in the immediate future would be or even whether he could again visit the cape. He therefore decided to land only the loose letters and to hold the sealed bags containing the important official despatches until the landing party returned with further information.⁶ The landing party, under Lieutenant Charles R. Arbuthnot, found a message from Captain Nares twenty feet magnetic north of a cairn on top of the cape and reported that, at an unconventional distance from a smaller cairn on a lower point, four cases and a cask were found, which they did not open, however, believing the cases to contain provisions and assuming that a cask in so obscure a position would not contain letters.⁷ The message from Captain Nares read:⁸

H. M. S. "Alert," at Cape Isabella,
29th July, 1875.

"Alert" and "Discovery" erected this cairn 29th July, 1875. Should the Strait be impassable for a sledge, the despatches from the expedition will be deposited in a cask on the lower point magnetic west of this position each spring of our stay north of Smith Sound.

Anyone having despatches or letters for the expedition, is requested to deposit them in the cask, unless he is coming farther north, in that case a cairn will probably be found at Cape Sabine, Dobbin Bay, Carl Ritter Bay, and Port Bellot. All well on board. No ice in sight.

Should the strait be passable, the despatches will be taken to Littleton Island.

G. S. NARES,
Commanding Expedition.

The wind having increased considerably in violence, it was not possible to return. As the wording of Captain Nares's message made it seem certain, however, that the cask on the lower point was the one referred to that would contain the expedition's despatches, Captain Young resolved to revisit the cape. After an unsuccessful attempt on August 7 and more than two weeks' cruising in the neighborhood watching for favorable ice conditions, Cape Isabella was finally reached on August 25. On examination the cases were found to contain preserved meat and the cask was empty. This showed that no sledge party from the Nares expedition had reached this point.

⁶ *Parliamentary Paper C 1636*, p. 471.

⁷ *Ibid.*, p. 476.

⁸ *Ibid.*, p. 477.



FIG. 7.



FIG. 8.

FIG. 7—Foulke Fiord (Etah) on the Greenland side of Smith Sound, with the headquarters of the Crocker Land Expedition on the foreshore in the foreground.

FIG. 8—"Borup Lodge," the headquarters of the Crocker Land Expedition at Etah. In the foreground, dog teams preparing to leave.

On both visits to Cape Isabella Captain Young left records of his movements. On the second visit the record stated that the sealed bags containing the despatches had been left at Littleton Island two days before, on August 23—a step decided on because at that time it did not seem probable that Cape Isabella could be reached. These records were buried twenty feet magnetic north of the small cairn on the lower hill.



FIG. 9—E-took-a-shoo, one of MacMillan's Eskimo companions on his Ellesmere Island trip, who discovered Sir Allen Young's record at Cape Isabella (see the text and Fig. 11). E-took-a-shoo was one of two Eskimos, companions of Dr. Frederick A. Cook on his Arctic journey of 1907-09, who testified to MacMillan that Cook did not reach the pole (see the February *Review*, pp. 140-141).

A fortnight after Captain Young's departure the ships of the Nares expedition, the *Alert* and the *Discovery*, stopped at Cape Isabella, on September 9, homeward bound. The landing party, under Commander Albert H. Markham, found the package of letters but failed to find Captain Young's record. Because of this Captain Nares did not know of the fact that the main despatches had been left at Littleton Island, and the expedition returned to England without calling there.⁹

It was Captain Young's records and a record left by Captain Nares

⁹ G. S. Nares's work cited in footnote 2, p. 174.



FIG. 10.

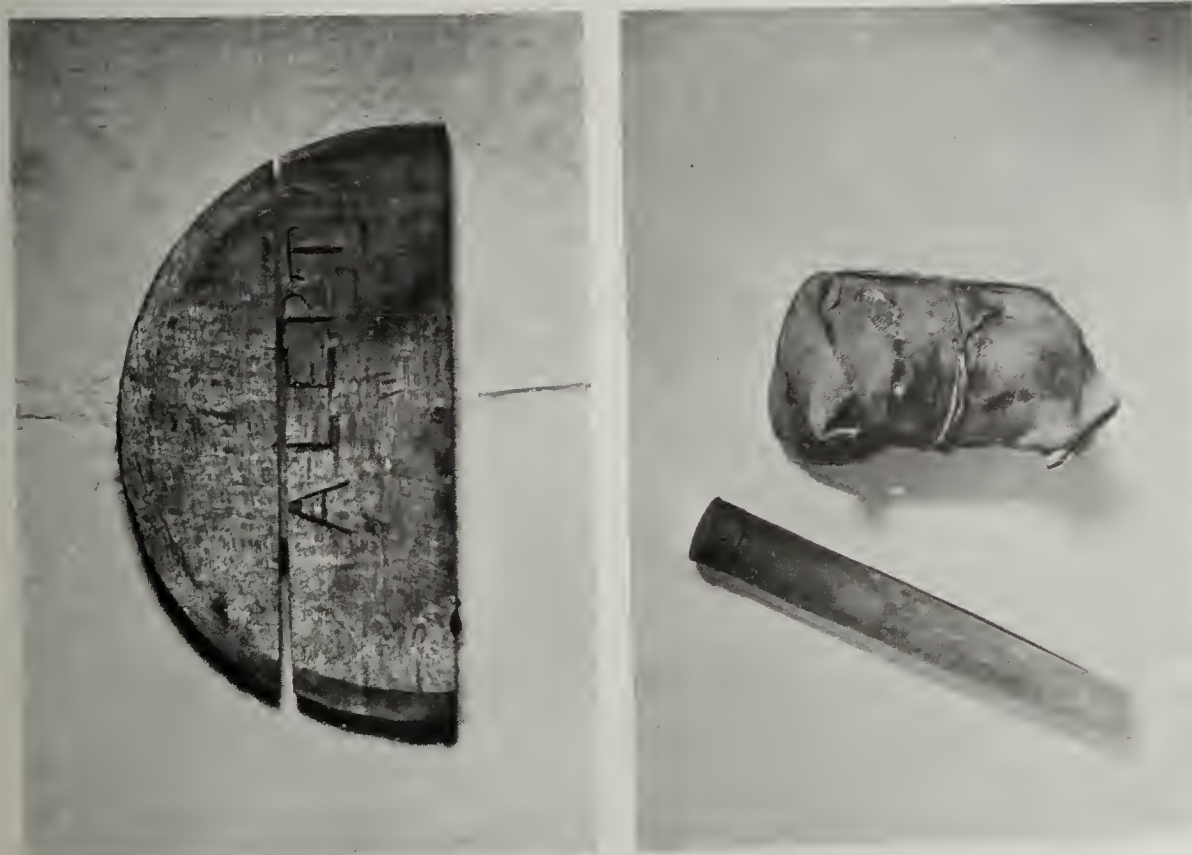


FIG. 11.

FIG. 10—Cairn erected on Cape Isabella by the British Arctic Expedition of 1875-76 under command of Captain (later Sir) George Nares.

FIG. 11—(Left) Head of a cask marked "Alert," found by MacMillan in 1917 at Cape Isabella, which contained records from the British Arctic Expedition of 1875-76.

(Right) Upper—Tin wrapped in saileoth containing despatches from Sir Allen Young of the *Payulora* expedition of 1876, found at Cape Isabella on MacMillan's trip of 1917. Lower—Copper tube containing Captain Nares's records which was inside the cask marked "Alert."

on September 9 that MacMillan had the good fortune to find. The main cairn (Fig. 10) on top of the cape was first examined, MacMillan reports, but it contained nothing. On descending to the lower point a cask was finally discovered with its head marked "Alert" (Fig. 11). Within was a copper tube containing the record written by Captain



FIG. 12—Sun dropping into the sea at Etah.

Nares, consisting of a summary of the work of the expedition. This, according to the copy furnished to the Society by Mr. MacMillan, reads:

Arctic Expedition

9th September, 1876

H. M. S. "Alert" at Cape Isabella

Her Majesty's ships "Alert" and "Discovery" arrived here on their way south to Port Foulke. The "Alert" wintered in Lat. $82^{\circ} 27' N.$, Long. $61^{\circ} 22' W.$, inside grounded ice. The "Discovery" wintered in a sheltered harbour in Lat. $81^{\circ} 44' N.$, Long. $65^{\circ} 3' W.$

The sledge crews of the "Alert," after a severe journey over the ice, succeeded in attaining Lat. $83^{\circ} 20' 30'' N.$, and the coast line from the Winter Quarters of the "Alert" to the northward and westward was explored to Lat. $82^{\circ} 23' N.$, Long. $84^{\circ} 26' W.$, Cape Columbia, the northernmost cape, being in Lat. $83^{\circ} 7'$, Long. $70^{\circ} 30' W.$

Sledge parties from the "Discovery" explored the north coast of Greenland to Lat. $82^{\circ} 21' N.$, Long. $52^{\circ} W.$ (approximately), a distance of seventy miles beyond "Repulse Harbour."

No land was sighted to the northward of the above explorations except a few small islands at the extreme of the Greenland coast explored.

Lady Franklin Sound was explored by the "Discovery" and was found to run S.W. 65 miles, and terminated in two small bays, also Petermann's Fiord for 19 miles, and was then found to be impassable for sledges owing to glacier ice.

A seam of coal 250 yards long and 22 feet thick was found in the neighbourhood of the "Discovery's" Winter Quarters.

[Passage illegible] employed in sledge travelling.

H. M. S.
"Alert"

Four deaths have occurred,—Neil C. Petersen, Interpreter, at Winter Quarters on the 14th May, from the effects of a severe frost bite (which necessitated a part of each foot being amputated) followed by exhaustion and scorbutic taint. George Porter, Gunner, R.M.A., on the 8th June of scurvy and general debility, when absent on a sledge journey, and was buried in the floe in Lat. $82^{\circ} 41' N$.

H. M. S.
"Discovery"

James J. Hand, A. B., of scurvy on the 13th of June and Charles W. Paul, A. B., of scurvy on the 29th June; both buried in Polaris Bay.

The ice in the Polar Sea broke up on the 20th day of July, and on the 31st the "Alert" left her Winter Quarters, and on the 12th of August joined the "Discovery." Both ships left "Discovery Bay" on the 20th day of August and proceeded south.

All well.

We are homeward bound with very little ice in sight. We shall call at Disco, but not at Littleton Island or Port Foulke.

G. S. NARES, *Captain R.N.*

Commanding Arctic Expedition.

Captain Young's records, together with a letter from Lieutenant Arbuthnot to Captain Stephenson of the *Discovery*, were found by E-took-a-shoo, one of MacMillan's Eskimo companions, in a tin wrapped in heavy sailcloth (Fig. 11). The record left by Captain Young on his second visit, as supplied by Mr. MacMillan, reads:

"Pandora," August 24th, midnight, 1876

Dear Captain Nares:

On our previous visit here—Aug. 6th, 1876—we were blown off by a gale and drift ice, and have ever since that date been attempting to regain the cape, a solid pack of drift ice extending from Cape Dunsterville on the west shore round to Cairn Point on the east shore preventing our reaching within 10 miles of Cape Isabella.

I have tried to get northward but have not been able to reach beyond Cape Paterson on this side, or Latitude $78^{\circ} 45'$ on the east side.

On August 6th our landing party were unable to examine the packages, and we were thus left in doubt as to whether they were your despatches or some of your provisions, and hence my attempts to regain the cape.

Failing in our repeated attempts to regain the cape, and seeing no prospect of our doing so this season, I landed the bulk of your letters and despatches on the lower point N.N.E. (mag.) from your cairn on Littleton Island and where I hope they will be even more accessible to you than on this cape.

After a heavy southerly gale yesterday, we have succeeded in getting through the S.W. pack, and if I succeed in getting back into clear water, I proceed homewards at the end of this month, having cruised here all the navigable season in the event of your sending a boat party to Littleton Island.

Trusting that you are all well and have succeeded in your arduous work,

Yours truly,

ALLEN YOUNG.

Landed at 1 A. M. August 25 and on examination found the cask to be empty and the cans to contain preserved meat. They will be left as they were found.

It is evident no sledge party has visited this place.

CHARLES R. ARBUTHNOT

Returning from Cape Isabella, MacMillan reached Etah on April 9. Starting again on May 3, MacMillan followed his previous route but this

time succeeded in advancing farther south along the Ellesmere Island coast. Instead of reaching Clarence Head ($76^{\circ} 40' \text{ N.}$) as reported in the October, 1917, *Review*, it appears that the farthest point attained was Boger Point ($77^{\circ} 25'$), from which, however, sights were taken toward the south. This disclosed the fact that Sonders Island ($77^{\circ} 10'$) is at present a nunatak interrupting the surface of a glacier. This circumstance and the fact that MacMillan counted fifty-five tidewater glaciers between Cape Sabine ($78^{\circ} 50'$) and Clarence Head as compared with nine indicated on a standard map based on conditions fifty years ago¹⁰ would seem to show that, even when allowance is made for the provisional nature of the earlier surveys, glacial activity has greatly increased throughout this region during the last half-century. The front of one of these glaciers, the American Museum Glacier, between Paget Point ($78^{\circ} 10'$) and Cape Faraday ($77^{\circ} 50'$), is almost 20 miles long; a similar glacier somewhat farther south is the American Geographical Society Glacier (Fig. 1).

Starting back from Boger Point on May 16, Etah was reached on May 24 and the trip thereby brought to its close.

¹⁰ Polar Regions: Baffin Bay to Lincoln Sea, 1:1,400,000, U. S. Hydrographic Office Chart No. 2142, which is based for this region mainly on surveys from a ship's deck by Inglefield in 1852 and Hayes in 1861 (for sources see note in October, 1917, *Review*, Vol. 4, p. 321).

MODERN ICELAND

By GODMUNDUR KAMBAN

I have sometimes been surprised to meet Americans with a thorough knowledge of so small a country as Iceland, but I have been equally astonished to find persons who firmly believed that Iceland is an uncivilized country. The fact is this: Three times in four centuries, respectively one-third, one-fifth, and one-ninth of its population have perished by volcanic eruptions, plagues, and famine, and the remainder went through terrific ordeals of all kinds. Yet, in spite of that, Iceland presents itself today as a self-governing nation, with full dominion over all its affairs, having taken into its own hands all means of communication, foreign and domestic, and exporting to almost every country of Europe products which have established themselves through their excellence. It has a thoroughly modern school system, with public schools, commercial and high schools, nautical, technical, and agricultural schools, and a college, almost four hundred years old, one of the oldest in Scandinavia, as well as a university, recently established. It has more than twenty-five newspapers, the oldest in existence over fifty years, and fifteen or more periodicals, one of which was founded over ninety years ago and is the oldest Scandinavian magazine. Finally, it has a rich literature and has produced authors and artists who, in spite of the handicap of coming from so small a nation, have made their names known and honored in other countries. If the Icelandic nation, with its old culture and its modern civilization, is to be classed with barbarians, well, the barbarians are to be congratulated!

I should like to ask my readers to take an imaginary trip to Iceland with me. We see by the map that Iceland extends from $63\frac{1}{2}^{\circ}$ to $66\frac{1}{2}^{\circ}$ N., its extreme northerly point being touched by the Arctic Circle. It is some 200 miles southeast of Greenland, about 600 miles west of Norway, and 500 miles northwest of Scotland, the distances given being those between the nearest points of the respective coasts. The area of Iceland is 40,500 square miles, or about 8,000 square miles greater than that of Ireland. An erroneous opinion prevails, suggested by its deceptive name and by its high latitude also, that Iceland is a very cold country. On the contrary the climate of Iceland is comparatively mild, its western, southern, and eastern coasts being protected from the polar ice by the Gulf Stream. The summer is never very hot, and the winter never very cold, the average winter temperature along the entire coast line being between 31° and 32° F.

We can choose a shorter and easier route to Iceland now than we could three years ago. We need not now go to England and wait there a week or two for a ship to come from Denmark and take us to our destination.



We can go direct from New York on one of the boats of the Icelandic Steamship Company, either the *Gullfoss* or the *Godafoss*, which make two voyages a year between New York and Reykjavik, the capital of Iceland. While we are on our way to the famous saga land, where practically all the masterpieces of the Scandinavian classics have been written and preserved—works acknowledged by modern scholars not to be inferior to those of Greece—let us first learn how it came about that this isolated and rocky island was ever settled.

SETTLEMENT

In the latter part of the ninth century Harold Fairhair gathered all the small states of Norway under his mighty rule. Iceland had just been discovered by Swedish and Norwegian vikings. Rather than submit to Harold's iron rule, which had deprived them of all their allodial possessions and privileges, these noble Norwegian chieftains and sons of chieftains preferred to go to this new island in the Atlantic, bleak and barren though they knew it was. Thus Iceland was not settled by men whom wealth and resources tempted to cross the sea, but by dethroned noblemen, or their descendants, who preferred a home in an uncongenial climate, where no forests gave them building timber, where no fields gave them food, to the loss of freedom. It should be remembered that the aristocratic spirit still lingering in Iceland, the independence that almost approaches defiance, is simply an inheritance from olden times. Georg Brandes, the Danish critic, well appreciated this characteristic and, in a speech delivered on Iceland a few years ago, closed with this toast:

Long live the glaciers never to be melted!
 Long live the fire never to be extinguished!
 Long live the defiance never to be bent!
 Long live Iceland!

Iceland was settled during the fifty-six years from 874 to 930 A. D., and there has been no immigration since. The population was at the end of that period about 50,000, and it is only 90,000 now. The glorious era of literature, and the romance of life also, which followed after that period, were due to this wonderful birth. For at least four centuries the noble ancestry of the Icelanders was fully acknowledged at all the Scandinavian courts and even in England. All Icelanders of good family were admitted to court in those countries, sometimes took up their residence there for a few years, and were honored with royal gifts. Such was the fashionable method of finishing one's education. The greatness of Iceland's classic literature is not only due to the men who had the time and genius to produce it, but to those also who had the opportunity to share in great scenes and great events.

FIRST IMPRESSIONS

Since it is in modern Iceland that we are chiefly interested, we now, nine or ten days out of New York, looking out beyond the bow of the ship, can

discern almost a hundred miles away through the blue forget-me-not haze of distance the southernmost glaciers, or *jökler*, rising white and majestic out of the ocean.

Early the next morning we arrive at the Westmen Islands, lying ten miles to the south of Iceland proper and so named after the Irishmen (at that time called Westmen in Scandinavia) who first settled there. They were slaves and belonged to the great number of bondsmen whom the Norwegian chieftains brought with them either from Ireland or Norway.

On one of the precipitous crags of the islands, if we are lucky, we may witness a typical Icelandic mountain scene. Amongst the sheer rocks, which no foot can climb, black gulls, guillemots, puffins, and other sea birds build their nests. The only way to catch these birds is to descend by means of a rope from a projecting ledge above them and to take them with nets. This requires two men, of whom one remains at the brink of the precipice lowering the other, suspended by the rope, down to the nesting places. The work demands great courage and dexterity. Sometimes men go down for other purposes than hunting birds. Angelicas grow there, those beautiful, huge, fan-shaped mountain plants, to be seen in many a garden—and for them many a young man will almost risk his life.

REYKJAVIK

Next morning, we arrive at the capital, Reykjavik. The name means “smoking creek.” When the first settler of Iceland, Ingolf Arnarson, landed at this place in 874 A. D., he observed a bluish-white cloud of vapor hovering over the ground and gave the creek this name. The vapor issued from the hot springs about two miles from the town. There are a great number of such springs in Iceland. A cold brook runs near this spring and the hot water tempers one branch of it into a swimming pool and the other into a general laundry place for the city. Before Ingolf settled, he threw his high-seat pillars into the sea, making a vow that he would build his home at the place where he should find them swept ashore. He found them here; so that he became both the first settler and the founder of the capital.

The inhabitants of Reykjavik number only about 14,000, but it is quite a modern little city, with gas-lit streets, a water-supply system, telephones and telegraphs, a university and all sorts of schools, a public library, and even moving-picture theaters. The new National Library is a fine building with over 80,000 volumes and about 6,000 manuscripts, many of them priceless. The same building houses the archives and ethnographic and natural history collections. There is a church for the free congregation. There is also the State Church, as in nearly all European countries. The religion of Iceland is Lutheran. In the center of the city on a large lawn stands a huge statue of the famous Danish-Icelandic sculptor, Thorvaldsen, given to Iceland at her millennial celebration in 1874. Before we leave we may be fortunate enough to witness one of those sunsets which have given Reykjavik

the name of "The City of Beautiful Sunsets." Some flamelike ball, fashioned of gold and vermillion, seems to have been tossed into the air, and a perfect miraele of eolors, to which it is vain to try to give names, is refraeted by the mountains and mirrored in the waters.

HISTORIC SCENES

We go next to Thingvellir, "Parliament Field," the historie place where for nine eenturies the parliament of Ieeland held its meetings. We take an



FIG. 2—The plain of Thingvellir, 25 miles east-northeast of Reykjavik. Thingvellir is a volcanic depression sunk between two great lava fissures, Almannagjá (Fig. 3) and Hrafnagjá. Thingvellir ("Parliament Field") was the meeting-place of the early Icelandic parliament. (Courtesy of the *American-Scandinavian Review*.)

automobile from the eity and in less than two hours arrive at the famous Saga retreat. Thingvellir is an extensive plain of grass lying between two lava fields. One of these lava fields is divided by a long deep chasm, the magnificent gorge of Almannagjá, or "Every Man's Rift," so ealled because the publie used to gather there for amusement while the members of parliament were working at the Law Hill. The way to the plain is through a steep portion of this chasm. In the heart of the gulley is the Öxarárfoss, "Axe River Fall." It is the only waterfall in Ieeland that might be ealled artificial. Originally the river flowed quietly along the top of the rocky wall without breaking through; but when this place had been selected as the home of parliament in 930 A. D., the founders took their axes and hewed a bed for the river over the edge, to make the view the more picturesque;

hence the name: "Axe River." The stream runs through a part of the gorge and, crossing Thingvellir, enters the largest lake of Iceland, Thingvallavatn, or "Lake of the Parliament Field," which covers about forty square miles. In this volcanic region Iceland's first parliament convened and founded the Icelandic Republic. A lava expanse between two gorges is the well-known Lögberg, "Law Hill," where the representatives gathered



FIG. 3—View through the lava-fissure of Almannagjá out upon the plain of Thingvellir, with Thingvallavatn, the largest lake in Iceland, in the background.

for legislative purposes. A few remains of the huts in which they lived when in session are to be seen to this day, scattered all along the slope. In the Axe River is the little holm called "Duel Isle" where, in those days of chivalry and romance, men used to settle their affairs of honor.

THE WORLD'S LARGEST GEYSER

Having spent the night at the inn at Thingvellir, we continue our journey to another famous place, the Geysir. In Icelandic the geological term for "geyser" is *hver*, "Geysir" being the name of this particular geyser, the

king of them all, which has come to be applied to all the spouting wells in the world. All around Geysir there are a number of smaller wells, which you can enjoy seeing spout twenty to thirty feet in the air while you are waiting for Geysir itself, for Geysir has grown more reluctant in the past twenty years. It used to spout every hour, but since the great earthquakes in 1896, it never spouts more than three or four times in twenty-four hours. Sometimes Geysir is quiet for a day or two, if left to itself. But fifty or a hundred pounds of soap thrown into the water will produce a fine spouting within half an hour. After a few heavy booms a gigantic column of water suddenly shoots into the air, and the outburst repeats itself at frequent intervals for some ten or fifteen minutes—a display of power and grandeur baffling description. After all is over, you will still stand there, fascinated by the power that has suddenly ceased, and perhaps listlessly watch a woman who has come to boil eggs in the dead calm of the basin—for the temperature of the water is no less than 230° F.

From Geysir it is but a few miles to Gullfoss, “Golden Falls,” the best-known waterfall in Iceland. It is not the highest, but is the one most abundant in water, and is, perhaps, the most beautiful, not only in Iceland, but in Europe.

VOLCANOES AND OTHER FEATURES

Going directly south, through a fair country, in a few days we reach a mountain of conical shape bearing an icy crown. It is the volcano Hekla. Were it not so remote Hekla might have been as famous in history as Vesuvius. Scientifically, Hekla is certainly the most remarkable volcano in the world. We have no record of Hekla's eruptions before the year 1004 A. D., but since that time it has had twenty-six eruptions with an average interval of thirty-five years, the longest time of inactivity being seventy-seven years. Yet, it is not Hekla that has inflicted the greatest disaster on Iceland. East of it lies the crater of Laki, which in 1783 covered an area of 218 square miles with flowing lava. Eighty per cent of the cattle, sheep, and ponies were killed, and more than 9,000 persons, or about one-fifth of the population, perished from famine and epidemics caused by volcanic gases. One of the greatest eruptions of Hekla ever recorded took place in 1845. Then sixty-seven years went by, with no sign of activity, and the scientists began to speak of Hekla as an extinct volcano. In 1912 Hekla awakened once more.

Far off, among the glaciers, lies the largest grotto in Iceland, Surtshellir. For many centuries it used to serve as a place of refuge for highwaymen and outlaws. Deep in its hiding-places there are still lying piles of bones of sheep and ponies that could not possibly be there unless brought by men. From here we ride along the glacier line, north to Mývatn, “Midge Lake.” It is inferior to Lake Thingvalla in size, but not in beauty. It is twenty-one square miles in area and crowded with miniature islands, on which

hundreds of thousands of eider ducks build their nests in spring. Eider down brings in a considerable revenue to Iceland. For generations the bird has been protected by law during the whole year. That is why you can go from one nest to another and with your hands lift the duck from her eggs—so tame is she. The down is not obtained by harming the bird. She builds her nest by plucking the down from her breast and, having gathered it into a little pile, she lays her eggs in the center of it. After she has hatched her eggs and her young ones have left the nest for good, the down is taken and cleaned.

The largest forest in Iceland, Hallormsstadaskógur, is located in the eastern part of the country. There are only four kinds of trees in Iceland: birch, willow, elm, and mountain ash, none of them more than thirty feet in height. During the last generation successful cultivation of the forests was begun by the scientific protection of old trees, by the planting of cuttings of native trees in barren places, and even by the introduction of new species, as the spruce, fir, and other conifers. The country abounds in plants and flowers of such brilliancy in color and richness in fragrance as can be found only in a northern country.

At a little town on the northern coast we take the steamer, and, as the midnight sun gleams like an eye of fire above the horizon, we sail back to Reykjavik. We bid farewell to the gentle, nimblefooted, and persevering Icelandic pony which carried us faithfully and safely on this long and strenuous journey. No one can believe, without a test, how strong and trustworthy this little animal is. As time goes on and the means of travel improve, the Icelandic pony will become less and less important; but, through the people's innate love for horses, the riding pony will always maintain its character.

INDUSTRIES

Farming is one of Iceland's leading industries, with sheep-raising as a prominent feature. An average farm has about ten head of cattle, fifteen ponies, and two hundred sheep; the largest has about fifty cattle, one hundred ponies, and a thousand sheep. There are more than one hundred dairies in the country. They export butter to the value of more than 1,000,000 kroners a year (\$270,000). Another important industry is fishing. The fisheries around the coasts of Iceland are among the largest of the world, equal to those of the Lofoten Islands of Norway and to those of Newfoundland. In the last ten years this industry has grown with tremendous strides.

In 1915, Iceland's exports of fish, meat, butter, horses, wool, eider down, fur, and other products amounted to 55,000,000 kroners (\$17,000,000). The great coal deposits, recently discovered; the enormous amount of boiling water, which could turn the barren land into a blossoming garden; the innumerable waterfalls, capable of running hundreds of factories, show

that Iceland's industrial prospects are highly promising. Two kinds of mines in Iceland are well known, the sulphur mines in the southern part, and the Iceland-spar mines in the eastern part. Iceland spar is the purest calcareous spar existing and has the quality of doubly refracting light, rendering it invaluable for optical purposes.

DRESS

Icelanders dress just as other civilized nations of Europe dress. For the men there is no national dress. As to the women, things are a little more complicated. While the majority in the cities dress just as their sisters do on the Continent, the women in the country still wear the Icelandic national costumes. The women wear as a rule two kinds of costume, an everyday dress, mostly in black, and the festival attire, which is a dress of blue or black velvet or cloth, embroidered with golden filigree around the sleeves and neck. The hair is worn loose, under a crownlike headdress, fastened with a round thin diadem of gold, and is draped into a veil which hangs down the back below the heavy gold belt around the waist. Sometimes the dress is simply of white taffeta or satin. However, the young girls of Iceland do not seem to like the national costume any longer. They have abandoned the sentiments of their grandmothers and aim to do away with their fashions in clothes also. They have fought for their enfranchisement and won it easily. In the new constitution, of June, 1916, Icelandic women were granted the right to vote.

GOVERNMENT

Iceland's political history began in the year 930 A. D., when the old republic was founded. This form of government lasted till Iceland, in 1263, came under the rule of Norway. When Norway became part of the kingdom of Denmark seventeen years later, Iceland also became a part of that kingdom. By the Treaty of Kiel, in 1814, Norway was separated from Denmark, but Iceland was retained by the Danes. Thus the Danes have practically ruled the country for more than six centuries, a period, which, down to the year 1854, was continuously distressful for Iceland. Nature, of course, had a large share in producing the misery and darkness of that time; but more disastrous than all the plagues, volcanic eruptions, and earthquakes together, was the pressure of commercial monopoly inflicted by the Danish government. The people of Iceland were left to the mercy of unscrupulous traders for more than two hundred and fifty years. Not only were the people obliged to deal exclusively with Danish merchants or those who had bought the trade privilege from the Danish government, but every farmer and fisherman was compelled to deal only with a merchant of his own county, even though the merchants could not supply them with sufficient food. If a man tried to sell three or four fish outside his county

and was detected, he was immediately stripped, bound to a pole, and flogged till the blood flowed. In 1854, Icelandic statesmen at last succeeded in having this abominable form of trade abolished, and from that year, which marked the beginning of an era of general progress, the people of Iceland have maintained a ceaseless fight for their political freedom. The father of this political reconstruction was the great statesman and historian, Jón Sigurdsson (1811-1879). He was president of Parliament for more than



FIG. 4—Scene on the eastern coast. Note the settlement clinging to the narrow foreshore at the foot of the mountain which slopes abruptly to the sea. (Courtesy of Henry E. Ferguson.)

twenty years, and he is still popularly called in Iceland “the President.” He provided Iceland with a tolerably good constitution in 1874 and laid down the principles of the great political reform introduced in November, 1903, by which Iceland became a self-governing country under the protection of the Danish King.

The Althingi, or Parliament, is composed of a Senate, with fourteen members, and a House of Representatives of twenty-six members. All forty members are chosen by popular vote and, when they assemble, choose the senators from their own number. Acts of Parliament are signed by the King of Denmark and countersigned by the Icelandic Prime Minister, who is chosen by Parliament. The legislative power is thus entirely independent of Denmark, and so also is the judicial power. The Supreme Court is located in Reykjavik and consists of two judges and a Chief Justice.

LANGUAGE, LITERATURE, ART

The language of the Saga—the ancient literature of Iceland—is the same tongue which was spoken a thousand years ago in all the Scandinavian countries, Denmark, Norway, Sweden, and Iceland. But while it is now a foreign language to Danes, Swedes, and Norwegians, it still lives in Iceland, and these sagas are generally the first books the children read. Icelandic, like the other Scandinavian languages, is of Teutonic origin, a sister tongue



FIG. 5—Hvammur on Skagá Fiord on the northern coast. Note in the foreground the carefully kept pasture from which the stones have been removed and heaped into neat piles. (Courtesy of Henry E. Ferguson.)

to German and to English, though the latter is largely influenced by Greek, Latin, and French. You would have no difficulty in tracing the relationship in a sentence like this:

English: If you will give me a glass of water, I shall be thankful. . .

Icelandic: Ef þú vilt gefa mér glas af vatni, skal ég vera thakklatur.

Literature has always been fostered in Iceland. An English statistician has calculated that the annual publication of books in Iceland is proportionately twenty-five times as great as that of the whole British Empire. But the tragedy of being an Icelandic author lies in the fact that the language, though highly cultivated, is spoken and read by fewer persons than any other modern language. If it were as widely spoken as German, or even Swedish or Danish, some of our lyric poets would long ago have gained the same recognition as Heine, Tegnér, or Drachmann. Still, nearly twenty

Icelandic authors of the nineteenth century have had their works translated into the different European languages, some of whom are: Jónas Hallgrímsson, the Wordsworth of Iceland; Steingrímur Thorsteinsson and Matthías Joehumsson, translators of Shakespeare and many English and German classics; Gestur Pálsson and Einar Hjörleifsson, realistic novelists; Einar Benediktsson, a lyric poet; and Indrith Einarsson, a contemporary dramatist.

Certain authors have marked a new era in Icelandic literature. Dissatisfied with writing merely for their own people they definitely broke tradition and, living in Copenhagen, began to write in Danish or bilingually in Danish and Icelandic. This effort of four poets of the younger generation has been crowned with remarkable success. Two of these, Gunnar Gunnarsson and Jónas Gudlaugsson, are novelists who have gained unqualified recognition abroad. But it is drama that has gained the greatest recognition. Indeed, for years, no plays have been welcomed in Denmark with such enthusiasm as the modern Icelandic. Johann Sigurjónsson has written four plays, some of which have found cordial appreciation in foreign countries.

Of Icelandic composers the best known, Sv. Sveinbjörnsson, has lived in Edinburgh for over forty years. He is the author of the Icelandic National Hymn and has written music to a number of English and Icelandic songs. Iceland has at least half a dozen prominent painters. The greatest sculptor is Einar Jónsson. His latest work—a monument commemorating the Icelandic explorer Karlsefni, who landed in America a thousand years ago—is to be erected in Philadelphia.

There are two men of world-wide fame, one an artist, the other a scientist, whose fathers were Icelanders: Albert Bertel Thorvaldsen and Neils Finsen. Finsen, the great physician, who discovered a cure for certain diseases by decolorized light rays and received the Nobel Prize in 1903, belonged to a well-known Icelandic family. He spent his youth in Iceland, graduated from the college of Reykjavik, and then went to the University of Copenhagen.

Two Icelandic scholars are known as the greatest authorities in the so-called "Northern Science," the old and medieval mythology and literary history of Scandinavia: Finnur Jónsson, professor at the University of Copenhagen, and Dr. Björn M. Ólsen, professor at the University of Reykjavik.

A man of great celebrity in scientific circles is the Icelandic geologist, Dr. Thorvaldur Thoroddsen, the first man to write the geographical history of Iceland.¹ The youngest scientist is Dr. Gudmundur Finnbogason,

¹ The most accessible of his major works to the non-Icelandic reader are perhaps: *Geschichte der isländischen Geographie* (transl. into German by August Gebhardt), 2 vols. to date, Leipzig, 1897-98. [Cover period to 1750.]
Explorations in Iceland during the Years 1881-98, *Geogr. Journ.*, Vol. 13, 1899, pp. 251-274 and 480-513.
Island: Grundriss der Geographie und Geologie, *Ergänzungshefte zu Petermanns Mit.* Nos. 152-153, Gotha, 1905-06. [With a hypsometric and a geologic map, 1:600,000.]—EDIT. NOTE.

a philosopher whose work has won high commendation from Henri Bergson.

There is one Icelandic name, known in America above all others,—that of the explorer, Vilhjálmur Stefánsson. He was born in Canada, but his mother tongue is Icelandic, both his parents being Icelanders who emigrated forty years ago.

NATIONAL DESTINY

The chief national aim of the Icelandic people, like the aim of every nation, should be, it seems to the writer, the development to the highest degree of that in which she may excel in the competition among nations. Wherever progress is dependent on numbers, it is evident that she will not be able to compete with other countries. But there is one sphere in which she may equal if not surpass other nations in the progress of civilization. That is in the sphere of literature and art. Not that of the ancients, for the Icelanders do not always live in the sagas. The name "Saga Land" does not even exist in Icelandic. She has not forgotten that no country has produced a greater classic literature, not even Greece. It was not Homer, but the author of *Njáls Saga*, who fashioned, in *Skarphédinn*, once for all, the perfect type of inflexible manhood, constantly meeting life's vicissitudes with a "silent sneer." It was not Sophocles, but the author of *Laxdala Saga*, who fashioned, in *Gudrún*, once for all, the perfect type of the intricate nature of woman, "spinning twelve yards of yarn" while she made her husband go to battle against her lover. But it is the Icelandic Renaissance, the art and literature of our own age, blossoming from the roots of this past, through which Iceland may be rescued once more from obscurity. It is in the sphere of art, if in any sphere at all, that this little nation will be able to display her greatness. For in national life, as in art, it is quality, not vastness, the intention, not the extension, which counts. After all, is not art the only thing immortal? When one contemplates what Iceland has suffered, and yet what she has achieved, what she is today, one can well understand the strange sense of pride that an Icelanders may feel in belonging to the smallest of all nations.

SOME INTERESTING GEOGRAPHICAL PROBLEMS IN THE EXPLORATION OF NORTHERN CANADA

By CHARLES CAMSELL
Geological Survey of Canada

Of the habitable portion of the globe northern Canada contains a very large area of imperfectly known or wholly unexplored territory, and in this are many fascinating problems requiring solution by the adventurous wanderer in the silent places of the earth. Because this territory is all more or less habitable, and its exploration not unlikely to be rewarded by discoveries of mineral resources of great value, it is incumbent on Canadians in particular to make some effort to dispel the darkness of ignorance and fill up some of the blank spaces that appear on the map of northern Canada. The field is wide, the problems numerous, the work exceedingly fascinating, and the results always worth the effort.

In a recent paper¹ the writer attempted to show what geographical work yet remains to be done, and the necessity for doing it, and estimated that, out of a total area of continental Canada of about 3,209,000 square miles, about 900,000 square miles must still be considered as unexplored. This unexplored area is contained in some thirty blocks ranging from 5,000 to over 70,000 square miles in extent and occupying much of the Labrador peninsula and the North West Territories.

Up to the end of the nineteenth century the Geological Survey of Canada had been very active in carrying on exploratory work, and after a period of several years quiescence an exploration program was again arranged only to be interrupted by the outbreak of the war in 1914. In that year part of the work of the Geological Survey consisted in the exploration by the writer² of about 350 miles of a hitherto unknown river, the Taltson, flowing into Great Slave Lake and draining a great part of the country east of the Slave River.

In 1915 F. J. Alcock³ mapped the lower part of Churchill River and in 1916 A. E. Cameron⁴ solved an interesting geographical problem by delineating the northern shore line of the western arm of Great Slave Lake. This shore line was marked on the map of Canada in broken lines and though traversed by Alexander Mackenzie⁵ in his voyage of discovery down

¹ Charles Camsell: The Unexplored Areas of Continental Canada, *Geogr. Journ.*, Vol. 48, 1916, pp. 249-257. [Abstracted below, under "Geographical Record."]

² Charles Camsell: An Exploration of the Region between Athabaska and Great Slave Lakes, *Summary Rept. Geol. Survey of Canada for 1914*, pp. 55-60.

Idem: An Exploration of the Tazin and Taltson Rivers, North West Territories, *Geol. Survey of Canada Memoir 84*, Ottawa, 1916.

³ F. J. Alcock: Lower Churchill River Region, Manitoba, *Summary Rept. Geol. Survey of Canada for 1915*, pp. 135-136. See also *idem*: The Churchill River, *Geogr. Rev.*, Vol. 2, 1916, pp. 433-448.

⁴ A. E. Cameron: Reconnaissance on Great Slave Lake, *Summary Rept. Geol. Survey of Canada for 1916*, pp. 66-76.

⁵ Alexander Mackenzie: Voyages from Montreal on the River St. Laurence through the Continent of North America to the Frozen and Pacific Oceans in the Years 1789 and 1793, London, 1801, pp. 7-22.

the Mackenzie River in 1789 and by the voyageurs of the Hudson's Bay Company en route from the Mackenzie to Fort Rae, had never been even approximately outlined. Mr. Cameron's survey places the shore line some distance farther north than the supposed location and cuts off much of the big point that separates the west arm from the north arm, enlarging the area of the lake by about 2,400 square miles.

GREAT SLAVE LAKE

The complete delineation of the shore line of Great Slave Lake is one of the most obvious geographical problems demanding solution in this region. The lake is said to have a superficial area of about 13,000 square miles and a total length of nearly 300 miles. Up to the present time the western arm is the only portion that has been fairly accurately outlined, this having been done by W. Ogilvie in 1888⁶ and A. E. Cameron in 1916. The north arm still requires some surveying before its shores may be said to be fairly well mapped, and this will be no simple undertaking because of the thousands of rocky islands that border its eastern shore. The shore line of this arm as it appears on the maps of Canada is the work partly of one of the Franklin expeditions⁷ and partly of J. M. Bell⁸ of the Geological Survey. The eastern arm of the lake has been partly mapped by a number of explorers from the time of Captain Back⁹ in 1833 down to the expeditions of J. W. Tyrrell¹⁰ in 1900 and E. T. Seton¹¹ in 1907; but since most of these travelers followed the same direct route to the east end of the lake much of the shore line, particularly on the south side where it is indented by deep bays, has never been mapped or described.

CARIBOU PLATEAU

Another problem of deep interest, not only to the geographer but to the geologist and physiographer as well, is presented by the large blank space on the map immediately north of the Peace River between Hay River and the 114th meridian of longitude. Approximately 10,000 square miles of this blank space is occupied by a high plateau, locally known as Caribou Mountain, standing nearly 2,500 feet above the general level of the country

⁶ William Ogilvie: *Exploratory Survey of Part of the Lewes, Tat-on-duc, Porcupine, Bell, Trout, Peel, and Mackenzie Rivers, 1887-88, Part 8 of the Annual Rept. Dept. of the Interior for 1889*, Ottawa, 1890.

⁷ John Franklin: *Narrative of a Journey to the Shores of the Polar Sea in the Years 1819, 20, 21, and 22*, London, 1823; see pp. 198-201 and section of three-sheet detailed map embracing the part of the route comprised between Isle à la Crosse and Fort Providence.

⁸ J. M. Bell: *Report on the Topography and Geology of Great Bear Lake and of a Chain of Lakes and Streams Thence to Great Slave Lake*, Report C of *Annual Rept. Geol. Survey of Canada*, Vol. 12 for 1899, Ottawa, 1902.

⁹ [George] Back: *Narrative of the Arctic Land Expedition to the Mouth of the Great Fish River and Along the Shores of the Arctic Ocean in the Years 1833, 1834, and 1835*, London, 1836; see Chapter 3 and the accompanying map.

¹⁰ J. W. Tyrrell: *Exploratory Survey between Great Slave Lake and Hudson Bay*, Appendix No. 26 to Part III of *Annual Rept. Dept. of the Interior for 1900-1901*, Ottawa, 1901; see pp. 108-110 and Sheet No. 1 of 22-sheet map accompanying report in pocket.

¹¹ E. T. Seton: *The Arctic Prairies: A Canoe-Journey of 2,000 Miles in Search of the Caribou, Being the Account of a Voyage to the Region North of Aylmer Lake*, New York, 1911; see maps on pp. 180-181.

to the east and north of it, and about 2,000 feet above the country to the south and west. With the exception of Sergeant R. W. Macleod¹² of the Royal North West Mounted Police, no white man to my knowledge has ever crossed the plateau, although it is easily accessible and plainly visible 20 to 30 miles distant, to the traveler on the Peace River from almost any point between Fort Vermilion and Peace Point. This is very strange when we consider that the Peace River has been used as one of the main highways of the north country for nearly 130 years. In 1914 J. R. Akins¹³ of the Dominion Topographical Surveys surveyed the 29th base line across the southern face of the plateau, reaching an elevation of 3,207 feet above the sea on that line. On the west travelers have not been nearer the plateau than the Hay River; and on the east the writer¹⁴ in 1902 made a reconnaissance trip along the base of the plateau following the Little Buffalo and Jackfish Rivers by canoe. On the north the plateau is not visible from the shore of Great Slave Lake but was seen by A. H. Mellor¹⁵ of the Royal Northwest Mounted Police when he ascended Buffalo River to Buffalo Lake in 1916 and by A. E. Tameron of the Geological Survey in 1917.

The slope up to the top of the plateau from the south is gentle but on the east and north is fairly steep. The crest line from all points of view is even and unbroken by any sharp peaks. Sergeant Macleod describes the top as rolling, dotted with lakes of all sizes, and covered by a stunted growth of spruce about 10 feet high. Macleod's traverse across the plateau was made with dog teams in December and January when snow lay deep on the ground and he was, therefore, unable to determine what the soil or bedrock was. The surface, however, he says is heavily moss-covered. He speaks of crossing a large lake about the size of Lesser Slave Lake, i. e. about 60 miles long, and lying near the southern edge of the plateau. This lake is still unmapped. This and the other lakes are said to be stocked with whitefish, and caribou roam all over the plateau. The plateau is quite uninhabited and is only visited for a short period of the year by Indians who go in the autumn to the large lake mentioned by Macleod for the purpose of fishing. The reason for this is that in winter it is a most inhospitable region because of its lack of timber, and in summer the mosquitoes and flies are said to be worse than in any other part of the north country.

Stray prospectors have been attracted to it by the report that a placer miner had found gold on one of the streams flowing out of the mountain. Partly to investigate this story and partly to do some general prospecting two well-known British Columbia prospectors traveled into the borders of the country by way of the Jackfish River in the summer of 1915. On the writer's way up the Peace River in September, 1916, he made inquiries for

¹² Appendix U, *Rept. Royal Northwest Mounted Police for 1911*, pp. 180-181.

¹³ *Annual Rept. of the Topogr. Surveys Branch for 1914-15*, Dept. of the Interior, Ottawa, 1916, pp. 67-68; on accompanying sheet is a small map showing type of soils and forest covering and a profile.

¹⁴ Charles Camsell: The Region South-west of Fort Smith, Slave River, *Summary Rept. Geol. Survey of Canada for 1902* (— Report A of Annual Report, Vol. 15 for 1902-3), pp. 151 A-169 A.

¹⁵ Appendix T, *Rept. Royal Northwest Mounted Police for 1910*, pp. 197-200.

these men but failed to get any news of them other than that they had been seen by Indians near the head of the Jackfish River in the autumn of 1915 and that their supplies of food were low and one of them was ill. What their fate has been he could not learn. The unknown had for them the same strange and compelling fascination that draws so many prospectors and explorers into the most remote and forbidding corners of the earth. These men apparently failed, and the problem of the Caribou Plateau is still unsolved. It is inconceivable, however, that the plateau will remain unexplored much longer as it has become easily accessible since the railway reached the Peace River at Peace River Crossing in 1915. It is clearly visible from Fort Vermilion—a point which can be reached in three days from Edmonton by rail and steamboat, but how to cross the plateau in summer may require careful planning.

Among the questions that require answering by the explorer of the Caribou Plateau are: What is the area of the plateau and what the geography of its surface? What is its origin and why should it stand out in the central plain of the Mackenzie basin, like a great monadnock, rising some 2,000 feet above it and separated by a hundred miles from the Laurentian Plateau on the east and by several hundreds of miles from the Cordillera on the west? Is it a horst of the Laurentian Plateau built out of granites or gneisses, or, as is more likely, is it composed of younger—perhaps Cretaceous—rocks, an erosion remnant like Birch Mountain or the Buffalo Head Hills to the south of it?

HEADWATERS OF THELON AND TALTSON RIVERS

Immediately north of Lake Athabaska, between the Doobaunt and Taltson Rivers and extending down the Thelon River, is another large block of unexplored territory, 47,000 square miles in extent, which up to the present has only been traversed—so far as known—by one white man. Samuel Hearne¹⁶ crossed this block of territory from south to north in 1771 on his way to the Coppermine River, and again on his return in 1772 he traversed it from west to east. For one hundred and forty-five years no one has attempted to verify Hearne's evidently inaccurate geographical results or to map the other physical features of a region apparently full of interest. Richard King proposed to pass through this region on his way to the north in an expedition which he planned while returning with Captain Back from the exploration of Backs River in 1835. In his book¹⁷ he publishes an Indian sketch and a description of a route which leaves Lake Athabaska at the Charlot River, descends the Tazin River to the mouth of the Taltson,

¹⁶ Samuel Hearne: *A Journey from Prince of Wales's Fort in Hudson's Bay to the Northern Ocean Undertaken by Order of the Hudson's Bay Company for the Discovery of Copper Mines, a North West Passage, etc., in the Years 1769, 1770, 1771, and 1772*, London, 1775 (reprinted as Publication VI of the Champlain Society, Toronto, 1911, which see for a reconstruction of Hearne's route on a modern map, his original being distorted, as it was based on dead reckoning and not on astronomical observations).

¹⁷ Richard King: *Narrative of a Journey to the Shores of the Arctic Ocean in 1833, 1834, and 1835, under the command of Captain Back*, 2 vols., London, 1836; reference in Vol. 2, p. 389.

and ascends that stream crossing the divide to the headwaters of the Thelon River.

This block of unexplored territory is forested on the south and west, but extends well into the Barren Grounds. It includes part of the basins and the headwaters of two large streams, the Thelon River, emptying east into Hudson Bay, and the Taltson River, draining north to Great Slave Lake and thence to the Arctic. The lower courses of both these streams have already been mapped—the Thelon by D. T. Hanbury¹⁸ and J. W. Tyrrell,¹⁹ and the Taltson by the writer²⁰—but the source of each of these streams is still unknown. When we consider the ease with which this region can be reached it is surprising that we know so little of it. Our maps show a string of lakes in dotted lines extending in an east and west direction across it along the line of travel taken by Hearne, and this is the sum of our knowledge.

This block is a part of the Laurentian Plateau and consequently a region of lakes. Its exploration, therefore, could be undertaken in canoes by following the watercourses. Indian canoe routes lead into it from two points on Lake Athabaska, one starting from Fond du Lac at the east end of the lake and the other from a point near Black Bay. The writer explored part of the latter route in 1914, crossing from Lake Athabaska to the Taltson River watershed and descending the Tazin River down to its junction with the Taltson. Instead of going eastward up the Taltson and crossing the divide to the Thelon, as King proposed and as the writer originally intended to do, he continued down stream to Great Slave Lake. The route from Fond du Lac is a difficult one, requiring many portages, but is regularly followed by the Chipewyan Indians of Fond du Lac on their way to their hunting grounds. A canoe route used by the Caribou Eaters runs eastward from Fort Smith or Fitzgerald, while the Dogribs of Great Slave Lake enter the region either by way of the Taltson River or from other points on the eastern arm of the lake. All the Indian canoe routes converge at a point on the edge of the Barren Grounds about the headwaters of the Thelon River, and the Indians from Lake Athabaska, Great Slave Lake, and the Slave River are in the habit of congregating in that locality in August every year to hunt caribou, which are said to pass there in thousands.

The rendezvous is apparently an Indian paradise for game. It is referred to by Hearne as a locality “remarkably favourable for every kind of game that the barren ground produces at the different seasons of the year.” He also says that he has “not seen or heard of any part of this

¹⁸ D. T. Hanbury: *Sport and Travel in the Northland of Canada*, London, 1904; see Chapter 4 and accompanying map in 1:3,500,000.

Idem: *A Journey from Chesterfield Inlet to Great Slave Lake, 1898-9*, *Geogr. Journ.*, Vol. 16, 1900, pp. 63-77, with map, 1:2,000,000.

Idem: *Through the Barren Ground of North-eastern Canada to the Arctic Coast*, *Geogr. Journ.*, Vol. 22, 1903, pp. 178-191, with same map, 1:3,500,000, as that which accompanies the book.

¹⁹ Work cited in footnote 10, pp. 121-122.

²⁰ Work cited in footnote 2.



FIG. 1.



FIG. 2.

FIG. 1—Hill Island Lake, until 1914 unexplored since Samuel Hearne crossed it in 1772 on his return journey to Hudson Bay after his expedition to the Coppermine River. Characteristic topography in the basin of the Taltson River, southeast of Great Slave Lake.

FIG. 2—Chipewyan Indians building birch-bark canoes on the same model and with the same kind of materials that Hearne's Indians used nearly one hundred and fifty years ago. (Photos from the Geological Survey of Canada.)

country which seems to possess half the advantages requisite to a constant residence that are ascribed to this little spot." Caribou are said to visit this part of the country in "astonishing numbers" both in spring and autumn. Ducks, geese, and swans are also plentiful at those seasons, and he refers to a species of partridge said to be as large as English fowls, though he will not vouch for the truth of this. The rivers and lakes, too, "abound in fine fish, especially trout and barble." This is no doubt the reason why the Indians still make such long and arduous journeys every year to reach it, for it means to them food and clothing in abundance with a minimum of effort in obtaining them after having reached there.

J. W. Tyrrell²¹ speaks of this oasis as extending down the valley of the Thelon River far into the Barren Grounds, though the Indians have long since abandoned the more northern portion and make their present rendezvous about the headwaters of the Thelon River, and in the region where Hearne and his horde of Chipewyan savages passed the spring of 1771 building canoes and preparing for their long march to the Coppermine River and a raid against the Eskimos. It is no doubt true that the locality where the Indians make their rendezvous abounds in game, but it is also true, as proved by the writer's own experience in 1914, that the country bordering it on the south and west is, with the exception of fish, particularly destitute of every kind of game, and the explorer must count on traveling many days from Lake Athabaska before he will be able to obtain caribou.

The purely geographical results to be obtained by the exploration of this region are particularly interesting, but it has an historical interest as well. One would no doubt find a great deal of hard work and much excitement in navigating the rivers of the region with their numerous rapids and falls, but there is also something very attractive in the Barren Grounds in summer time and the sparsely timbered country bordering it, known to the Indians as "the land of little sticks." It is not only the game that attracts the Indians to this region. To them it is not merely a land of plenty, but to those of them who live most of their lives in the forest it is a land of beauty, with a charm in the summer time not to be found anywhere else except perhaps in the high mountains about the timber line. That this fascination exists is acknowledged by everyone who has traveled in "the land of little sticks." To the Indian it is expressed in the words²² of Saltatha, Warburton Pike's faithful companion and guide in his exploration north of Great Slave Lake, when he asks the old priest who is explaining to him the beauties of heaven:

My father, you have spoken well; you have told me that heaven is very beautiful; tell me now one thing more. Is it more beautiful than the country of the musk ox in summer, when sometimes the mist blows over the lakes, and sometimes the water is blue, and the loons cry very often? That is beautiful; and if heaven is still more beautiful, my heart will be glad, and I shall be content to rest there till I am very old.

²¹ Work cited in footnote 10, pp. 121-122.

²² Warburton Pike: *The Barren Ground of Northern Canada*, London, 1892, p. 276.

These are some of the most obvious problems demanding solution in the geographical exploration of northern Canada, and the difficulties and compensations attached to them. Farther north in the Cordillera, in the Mackenzie lowland, and in the Laurentian Plateau on either side of Hudson Bay are many others equally interesting and promising as rich a reward to the adventurous explorer who has the time, energy, and opportunity to undertake their solution.

THE RACIAL HISTORY OF THE BRITISH PEOPLE¹

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The Three Races of Europe

The idea of the three European races, Nordic, Alpine, and Mediterranean, which Ripley has done so much to expound, has received very general assent. The Nordic and Mediterranean probably represent divergent accumulations of characters among mixtures of the ancient long-headed stocks discussed by the students of primeval man. The Alpine stock, on the other hand, represents a westward spread through the mountain zone of Europe, and, as mountain countries inevitably tend to export population, it has spread downhill and has met and sometimes pushed back sometimes fused with, the long-headed stocks on the flanks of its home.

MEDITERRANEAN

The dark, rather short, long-headed Mediterranean is characteristic of the coast lands of the western part of the Midland Sea, but it has representatives in the southern Aegean and it may have immigrated into Greek coastal valleys from the Bronze Age onwards. In this region it has had age-long relations with Africa, and the climate has been warming on the whole since the end of the Ice Age. From this region, again, it spread up northward, probably as the ice retreated, mainly through western France. The Rhone valley, heavily forested as soon as the climate permitted, was difficult; the Carcassonne gap, with a good deal of limestone near by, remained more open. In this way, with northward movement, the type reached Britain, probably before it had its Mediterranean characteristics very fully developed.

NORDIC

The tall, strong-boned Nordic, with his fair hair and blue eyes, probably represents a type evolved in the region north of the great Eurasian mountain zone, where, in early human times, it would appear that tundra gave

¹ For the detailed evidence on which rest the chief conclusions of this article, see the following papers:

- (1) H. J. Fleure and W. E. Whitehouse: Early Distribution and Valleyward Movement of Population in South Britain, *Archaeologia Cambrensis*, 6th Ser., Vol. 16, 1916, pp. 101-140; with bibliogr.
- (2) H. J. Fleure and T. C. James: Geographical Distribution of Anthropological Types in Wales, *Journal Royal Anthropol. Inst. of Great Britain and Ireland*, Vol. 46, 1916, pp. 35-153.
- (3) H. J. Fleure: Ancient Wales: Anthropological Evidences, *Trans. Hon. Soc. of Cymmrodorion*, Session 1915-16, pp. 75-164; with bibliogr.

For a general discussion of the questions of British ethnology treated in this paper see:

- Arthur Keith: *The Antiquity of Man*, London, 1915.
T. Rice Holmes: *Ancient Britain and the Invasions of Julius Caesar*, Oxford, 1907.
J. Déchelette: *Manuel d'Archéologie*, Paris, 1912-14.
G. Dottin: *Manuel Celtique*, 2nd edit., Paris, 1915.

place to cold steppe and forest, the last on the whole replacing the others as the ages passed. In Britain we have, as it were, an overlap of the provinces of these two races, and it is probable that we are best advised in speaking of an important element of the British population as neither Nordic nor Mediterranean in the full sense, but as a survival of old long-headed types remaining incompletely differentiated into one or the other but influenced by later immigrants of both these stocks.

ALPINE

The thickset, broad-headed Alpine race (Alpine-Armenoid might be more correct) occupies the mountain zone, and we may distinguish broadly a Pyrenean-Cevenole Alpine variety, a Slavonic variety (especially North Slavonic) with less dark coloring, and an Illyrian and Anatolian variety with the height of the head much accentuated.

Intermediate Types

NORTHEASTERN

On the south, the mountain zone, e. g. in Italy, grades somewhat abruptly into the coastal country where Mediterranean man is at home, but on the north the mountains are flanked by broken highlands in the intricate and long-forested river basins of which Alpine man has for centuries been busy making clearings. In this region he has mixed with the Nordic while on the whole pushing him back, as the farmer does the backwoodsman. Here therefore have arisen mixed or graded types. These intermediate types combine something of the breadth of head of the central or mountain type with a great deal of the fair coloring and strength and length of bone of the Nordic. Of special importance for Britain are certain people traced as a wave of migrants from western Russia, perhaps the province of Kiev, south of the Pinsk marshes, along the European plain to Britain in the days heralding the Bronze Age. These people are traced by their beaker pottery and are thence often called for convenience the Beaker men. They seem to have been tall, broad-headed, strong-browed, and rough-boned; and it is quite likely that the type arose as an intermediate through intimate contact of small groups of broad-heads beginning to make, and to settle in, forest clearings and ultimately mingling with Nordic forest wanderers.

NORTHWESTERN

The above is the most characteristic of the intermediate types on the northeast of the mountain zone. Other types of intermediate character seem to have arisen in the tangle of hills and valleys to the northwest of the mountain zone. They are mostly big men with strong bones, having broad heads from their mountain ancestors and long faces with strong chins from their forest kin. Many of them seem to be red. Among these mixed

types we include the traditional Flemings, the type "Lorrain" and the Kymris of French authors, the Belgae and the red Caledonians of Latin authors, the typical "Anglo-Saxon" of some writers, and many more. They are specially related to the movements of men with leaf-shaped swords—the movements of the western early Iron Age and of post-Roman times. Perhaps it would be best to describe the Slavonic peoples as the corresponding mixed types on the northeast flanking of the European mountain zone, at any rate from the Iron Age onwards. As there is some ground for associating the root language of Slavonic with the northeastern mixture we are not surprised to learn from linguistic students that these two root languages are akin and probably represent divergences from a common origin.

SOUTHERN

On the southern flank of the mountain zone the broad-heads have spread downhill towards the Mediterranean but in some parts have come down as a solid block and have made contact with a solid block of the older long-headed type, with its very different traditions. Such conditions do not favor the rise of an intermediate type, as does the intimate mixture resulting from more intimate fractionated contact. There is, however, an intermediate type, Mediterranean, with an Alpine jaw.

There is ground for thinking that, on the Aegean coast, with mountain valleys and islets closely linked, an intermediate type has arisen with broad head, dark coloring, and stalwart build, like the Illyrian mountaineer but without his peculiar height of head and with several small hints of kinship at the same time to the Mediterranean race. This intermediate type may have played a part in the life of western Europe for some thousands of years, mainly owing to its activity in the old coastwise navigation and the development of fisheries and of seamanship thence resulting. We note its importance on those parts of the British coast which are interested in Iceland fisheries. It would be a great thing for western Europe if the old coastwise life, helped by intensive cultivation near the warm water, could be revived. It would renew the social health of many coast towns; it would provide recruits for fisheries and mercantile marines, as well as war navies; and it would give this interesting type its much-needed opportunities to make its best contribution to humanity.

Moorlands in Britain

EARLY LIFE

Had we been able to visit Britain, let us say, when it had recovered from the Ice Age we should have found it a forest-elad peninsula, in the main, probably still linked to Europe by a low isthmus in the region of the present Straits of Dover. Certain parts of it, whether because of the porous soil or rock or because of their exposure to the sea winds, would have been bare,

and man, armed only with stone tools, would have been restricted almost entirely to these bare patches. How could he fight the damp forest till he had metal with which to cut down its trees? Then, too, the forest and swamp were the haunts of wild beasts—cattle will still run, they say, if one



FIG. 1—Sketch map showing the habitable area of southern Britain in Neolithic time. Scale, 1:4,700,000. Redrawn from a map facing p. 83 of paper (3), cited in footnote 1. The first, slightly different version of this tentative map, based in part on the work of W. Boyd Dawkins, accompanied paper (1). Several small modifications have since been suggested in a note entitled "A Map of Primitive Britain," *Geogr. Teacher*, Summer, 1917, number, pp. 85-87.

attempts a wolf howl in their vicinity—and we find that the wild boar was the emblem of death in some Celtic traditions; both facts are significant of the terrors of the dark woodland. Add to this again the ague that probably haunted the swamps in those days, and we have sufficient reason for thinking of those who came into Britain after the Ice Age as, in the main,

moorland dwellers. Now we have on the moorlands of Britain almost everywhere the works and memorials of our forefathers, though we have been taught too often to look upon them as the remains of a vanished race, and it is interesting to try to glimpse a little of the life of those days, if only to see what it has bequeathed to us.

MOORLAND AREAS

The most important of the moorlands of South Britain was undoubtedly the Downs country, where the round hills stand bare both because of exposure and because trees will not grow naturally on the porous chalk unless it be covered with other material. The Downs country was important because it afforded a great extent of pasturage, because it permitted travel from pasture to pasture along its even ridges, and most of all because it contained rich supplies of flints for weapons and tools.

In the Chilterns and in East Anglia the chalk was much covered by forested boulder clay, that is, by *débris* left after the retreat of glaciers. The chalk is thus exposed chiefly in the valleys, and it is in them rather than on the heights that we find traces of our Stone Age ancestors.

From the Western Downs there were open hill lines leading along the Blackdown Hills to the moorlands of Devon and Cornwall, along the Mendips to the coast, and so across to Barry and South Wales, over what may have been a sand-dune country, but is now the Bristol Channel, and along the Cotswolds to the Northampton Heights. None of them had any wealth of flints, but the far west had stone which men learned to grind into axe heads, and thus the west country became a famous Stone Age center. The Midlands were then, as ever, "sodden and unkind," but there were more open patches on the Chases round about Birmingham and also small ones in Leicestershire. The southern Pennines were an important open space, but farther north the habitable zone was restricted because so much of the country was very high and rocky. The Lincolnshire Hills, the Yorkshire Wolds, and the North York Moors to a lesser extent were habitable. These English areas were sharply divided from Wales by the great forest-and-swamp barriers of Dee and Severn. In Wales some coastal moorlands had a comparatively delectable climate, and there was some flint to be got on the beaches; the open country inland was for the most part very high and bleak. Of coastal moorlands, one notices especially the sunward slopes of the hilltop expanses of Glamorgan, full of traces of early man, moorlands isolated by great forests from the Cotswolds and, later on, by sea from the Mendips. It is an area of ancient isolation, where the Silures maintained themselves so long against the Romans, and where persists a certain type of tradition—an intractability that contributes not a little to the troublesome misfit of the South Wales coalfield in a social polity evolved largely on the English plain.

DESCENDANTS OF NEOLITHIC BRITONS

It is in the valleys around these ancient open spaces that we still find the descendants of the Neolithic people. The population has left the moor-land to its sacred memories; it is the hallowed land of All Souls, and its old-time shepherds are now in great part industrialized in the slum lines along the valleys around the Pennines and in South Wales. On the English plain the old population is generally found nowadays on the bad lands, whether it be on Romney Marsh, or in the poor parts of the fens, or on the sandy heath and woodland patches, as, for example, between Salisbury and the New Forest.

These descendants of the Neolithic folk are the long-headed, long-faced, dark-haired, brown-eyed people that form so strong an element of the population of big English cities. They seem better able than all other types to withstand slum conditions, so that in the second generation of great-city life they have arisen in their millions to form once more, after many days, almost a majority, perhaps, of the population of South Britain. That they have begun to oust the typical John Bull in the Continental descriptions of the Englishman tells an important tale, and we appreciate the fact that it must be extremely difficult to displace a population which is attached to the land. The physique of the early British population, perhaps improved by better food, is thus abundantly amongst us at the present day, but that is not all; ever so many details of our life owe their character to that far-off period.

ORIGIN OF MAY DAY AND ALL SOULS

It was difficult work observing the sun and stars in a cloudy land like Britain, and perhaps astronomical observations came into importance later on when trade with sunnier climes began, towards the end of the Stone Age. But spring and autumn have glorious associations in nature in Britain, and must have been a pageantry of paradise in those ancient times. The woodland was largely oak and birch and ash, with alder in swampy places, and pine also here and there; but along the upper edge of the woodland, festooning the rocky knolls, must have flourished the thorns and the gorse bushes, with fern on the moorland above.

In the middle of May the new leaves of the forest would be a sea of green, fringed above with a white and foaming crown of thorns in bloom, while the gorse would flame the hillsides with its seeded gold. Spring in Britain is still one of the wonders of the world, but its glories when history was young and the land was still untamed must have been almost more than poets have conceived. Likewise autumn, with its red russet of the bracken and its many-tinted leaf browns, reached its short but wonderful zenith towards the middle of November. These two glories marked the great festivals of May Day and All Souls, and if the change of eleven days in the eighteenth century confused the issue a little, there is still enough of the

old tradition left for us to guess its former importance. In western Wales the houses are let and the farm servants hired about November 12, the old festival of All Saints. Even in England in 1915, in spite of war and poverty it was necessary to issue regulations against fireworks on November 5, the decayed celebration, not so much of the Gunpowder Plot fiasco, as of the burning of the old year.

OTHER INHERITANCES

Old earthworks on the moorland give their names to the hundreds and other administrative divisions here and there. Boundaries of counties still run along the courses of rivers, though these are no longer uninhabited tracts between the populated moorlands. Indeed, now that the people have congregated about bridgeheads, these old boundary lines are a positive nuisance and defeat attempts at good administration in all sorts of ways. Thus is our life sown with heritages from a moorland past.

The moorland life probably lasted on through the Bronze Age and into the Iron Age. Indeed it is probable that, as on the Continent, it was the post-Roman centuries which witnessed the most definite downhill movement, settlement becoming general with the clearing of the forested low lands.

Invasions in the Bronze Age

TWO NEW ELEMENTS

When the knowledge of bronze came to dominate social organization in the eastern Mediterranean, prospectors seem to have scattered about looking for copper and perhaps for gold, and so coastwise trade and movement began in the third millennium before Christ. Evidence is accumulating to show that this eastern Mediterranean was also spasmodically influenced by pressure from the grasslands and consequent crises and movements which must have added to the coastwise changes just mentioned. One of these crises seems to have ended the old kingdom of Egypt and to have continued during the interregnum before the Middle Kingdom was established. According to most chronologists this period of trouble would be about 2500-2200 B. C. Another aspect of the same trouble destroyed Hissarlik I. about 2300 B. C. There is thus some evidence of general unrest in the Bronze civilization of the eastern Mediterranean and in the life of eastern Europe generally towards the end of the third millennium before our era. Now, at some time before the introduction of bronze into the west of Europe we get evidence of movement or trade, and then bronze came in, probably by way of western Gaul to Britain, while at much the same time the Beaker people (discussed above in general terms) arrived, apparently without bronze, on the eastern coasts of Britain from Kent probably right up to Caithness sooner or later, though the more northerly immigrants were almost purely Alpine in type.

From the close correspondences between dolmens and other megaliths, dark, broad-headed men and ancient sources of copper and tin, we may say that these men from the eastern Mediterranean were the carriers of the

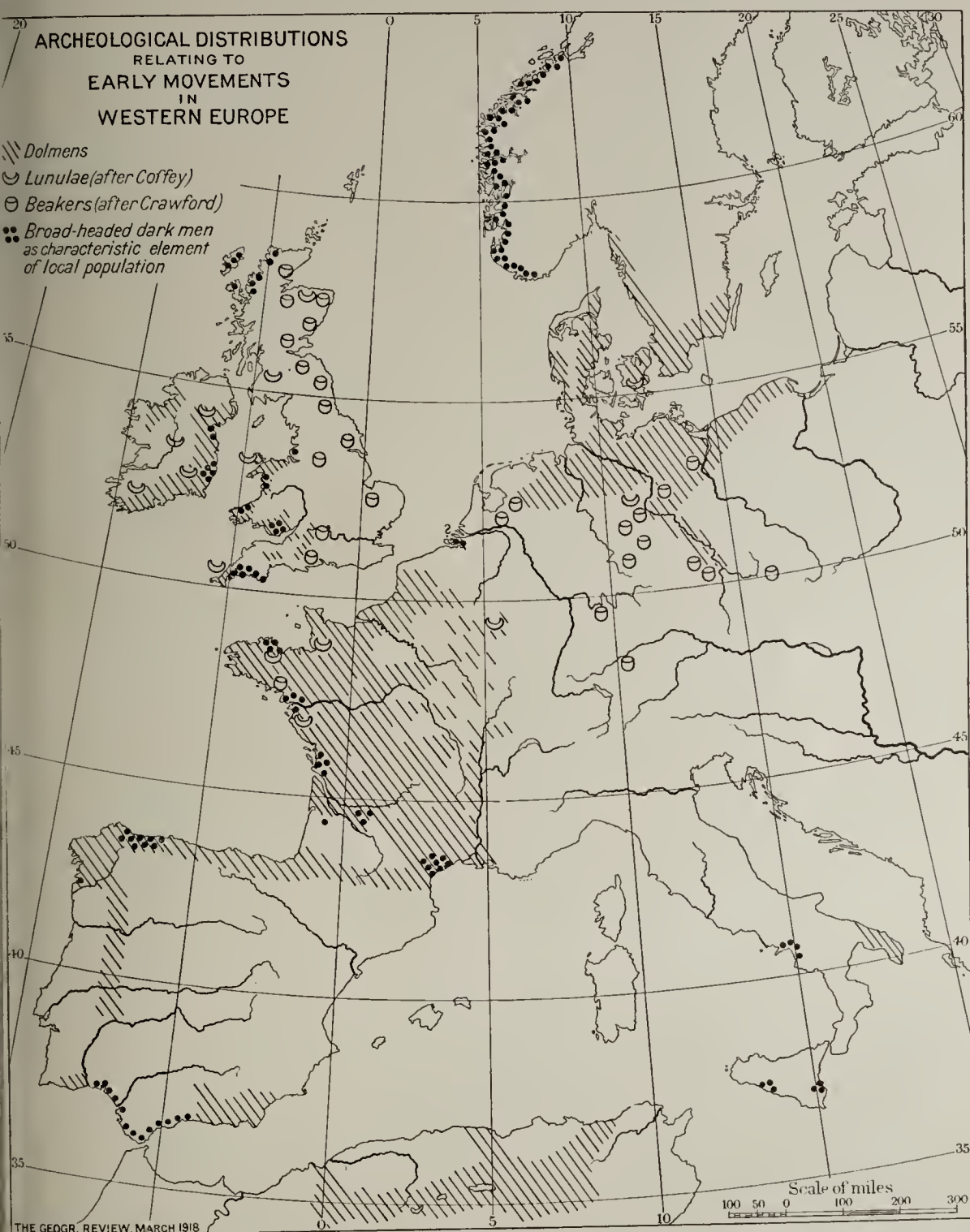


FIG. 2—Sketch map showing certain archeological and anthropological distributions relating to early movements in western Europe. 1:22,500,000. Redrawn, with modifications by the author, from a map facing p. 97 of paper (3), cited in footnote 1.

Bronze civilization, and that they met in Britain the Beaker people who had come across the North Sea from the European plain. The "Beakers" are characteristic of eastern Britain, though they spread west along the

Downs and from the Humber to the Peak at any rate, both lines with opportunities of movement above the lowland forests. Beakers are characteristically absent from Cornwall, where the megalithic, mining, dark, broad-headed life, if these may be associated, was particularly strong.

In this way, two new elements, both broad-headed, were added to the British population. Stalwart dark men spread along western Britain and in Ireland, while the great rough-boned Beaker people, called by most writers until quite recently the Bronze Age invaders, reached the east coast. These invaders were followed by other broad-heads of Alpine type.

INTRODUCTION OF THE GAELIC LANGUAGES

From the eastern Mediterranean we know that the periods 1750-1500 B. C. and 1250-1150 B. C. were periods of disturbance spreading from the grasslands in the first case and perhaps from mountain forests in the second, and there can be little doubt that the movements towards Britain continued. The traders' search for metal went on in the interval, and routes from the Euxine and the Adriatic to the Baltic were opened up as well as routes beyond the Pillars of Hercules and northward across western Gaul.

Ireland, with its gold of the Wicklow Mountains, became a goal of the treasure-seekers, and we may think of both Beaker men and dark broad-heads as struggling to reach it. A very few beakers have been found in northwestern Ireland, and the spiral ornament introduced in the Bronze Age from the Baltic occurs at various spots in the northern half of Ireland, while gold ornaments undoubtedly from Ireland occur *inter alia* in northeastern Scotland. It is thus likely that one way by which Beaker men, perhaps including the legendary Tuatha De Danann, reached Ireland was via northern Scotland during the Bronze Age. Now northern Scotland, the Hebrides, western Scotland, Man, and Ireland are the province of the Gaelic languages, and it is at least possible that they were introduced along this route. This possibility is enhanced when we remember that the Beaker type is also highly characteristic among the Julian gens and other patrician Romans, and that early Italic is looked upon as an offshoot of the root form of the Gaelic languages. In other words we have more than a possibility of a dispersal during the second millennium before our era from the western Russian plain bringing Gaelic to the far west and the beginnings of Latin to Italy. We doubt whether the first Beaker men, those who invaded eastern Britain about 1900 B. C., used Gaelic; more probably a later phase of the movement brought this still surviving element of our life.

EVOLUTION OF LANGUAGES

One may perhaps be permitted to let the imagination roam a little as regards evolution of languages. Starting from the widely accepted idea that the Aryan family of languages arose on, or perhaps around, the great

steppe, we may suppose that the relatively wide currency of a language in such circumstances would steady it and shear off its eccentricities. Thus it would have an advantage over forest dialects spoken differently perhaps in almost every village. If this be so, then in the period following pressure of grassland folk through the parklands into the forest (such as perhaps the period following 2500-2200 B. C.) there might well be an infiltration of the language of the steppe border gradually supplanting forest dialects on its way. This may help us to understand the Gaelic-Italic spread, with Lithuanian perhaps as evidence of a still earlier spread. If so, we may argue one step further and think of the people of the northern Alpine flank learning this Gaelic-Italic root language and modifying it into the Brythonic-Slavonic root language, becoming Brythonic in the northwest and Slavonic in the northeast.

ANCIENT ROUTES THROUGH BRITAIN TO IRELAND

The Beaker type persists in some numbers among the professional classes in Britain and in the general population of the Tyne Gap and the Cumbrian dales and of Merionethshire, both places most probably connected with old ways to Ireland. The way across from the Northumberland to the Cumberland coast is evident enough, and it is a district influenced by megalithic culture of a sort and possessing also instances of the prehistoric spiral ornament. Merionethshire can never have had much thick forest. Men seeking a way westward from the Humber and the Fens to the Peak could come westward to Chester and the Wirral, or southward and then westward via the Chase country and the Longmynd, and so reach the Welsh Hills. An old paved way, called the Roman Steps, leads through the Rhinog Mountains of Merionethshire, and at its western end we are in a typical west-coast megalithic country, evidently in touch with Ireland, as gold and the spiral both indicate. It may therefore be that this was one route along which the two new elements of British life came into contact.

DOLMENS

Of the metal workers and seekers from the south we think it possible to surmise that, while in earlier times they prospected somewhat generally, as time went on they went more and more directly to and from the west, Spanish Galicia, Armorica, Cornwall, Wales, and especially Ireland. These are the dolmen lands *par excellence*, and the various types of monuments need to be studied by survey, with the thought in mind that they may be not so much links in a chronological sequence as works of different groups of men. It seems possible that these monuments are mainly at ports of call along the trade routes or on cross-peninsular ways which shortened sea voyages without introducing too many difficulties of travel on land through forests. The increasing directness of travel to Ireland seems indicated by some elaborate Cyclopean monuments supposed to belong to a late

phase of the Bronze Age. They are not generally distributed but occur on the Spanish coasts and in eastern Ireland (New Grange, e. g.), as also in the Orkneys and Caithness, and, in quite another direction, in southern Russia. They are allied to the Tholos tombs of the Greek mainland. I should, however, be remembered that probably the movements of megalith builders began even before the spread of bronze to the west.

STONE CIRCLES

Another type of monument in Britain has an extraordinary interest; it is the great stone circle exemplified at Avebury, Stonehenge, and in the Hebrides and Orkneys, with lesser circles along the western side of Britain in many places. The complete type occurs elsewhere only in the region between Tripoli and the Gulf of the Syrtis and affords evidence of former links with that far-off country, evidence which is strengthened by the finding of segmented beads of the XVIIIth Egyptian Dynasty in a tumulus in Wiltshire. There is also much evidence in Bronze Age finds of links between western Britain and Armorica. All this more than hints that there is at least a foundation of fact in our British and Irish legendary histories which, like those of the other western nations, claim that some of the British tribes came from the Aegean and included refugees from Troy. The legendary histories, no doubt based on folk tradition, have in all probability fused together a number of distinct movements so that the tangle is a difficult one, but the Tuatha De Danann, the Milesians, the Scots, Brut the Trojan, Lear, Corinius, all probably have some historical foundation. It is one of the tasks of archeologists and anthropologists in years to come to see what can be reconstructed concerning this evidently interesting phase of our country's early history. Coffey and the Irish Museum have given a good lead in this direction by cherishing and studying the fine gold ornaments in which Ireland was then so rich. It is interesting that our legendary histories, especially Geoffrey of Monmouth, who has elements not hitherto found elsewhere, not only speak of these Aegean wanderers, not only tell us in poetic phrase about the Stonehenge monument (type) having come from the "uttermost parts of Africa," not only tell us of the coming of the sword (Excalibur?), but also refer to the conflicts which took place in Britain between these southern folk and certain Huns from Scythia, who might be the Beaker people or people who followed them across the North Sea.

STONEHENGE

Stonehenge is near the great road center of early times, and its erection and elaboration, probably about 1700-1300 B. C., show that this center had already begun to have that durable primacy as the place where contributions to British life from east and west met and fought and fused. It may have been so in the Bronze Age; it almost certainly was so in Anglo-Saxon

times, and Arthur and Alfred are linked heroes of the great struggles around this center of tradition and sanctity. The primacy of this district departed as the growth of the wool export trade made the position of East Anglia so important, but the Wiltshire Downs country remained of the greatest consequence until the rise of modern industrialism. It is interesting that this is only one among many examples of primacy of regions where many traditions have met and ultimately fused. The Paris Basin is the classical instance in western Europe, but the Aegean itself is another case in point, and all illustrate the importance of the mingling of peoples as against the notion of the super-race protected from contamination. It seems certain that during the Bronze Age a number of immigrations and invasions of Britain occurred and, quite probably, Britain felt once more a double pressure in the general convulsions round about 1200-1100 B. C. It is probable that some of the migrants mentioned in Irish and other legendary history were refugees from old Mycenaean communities of that time, destroyed by the coming of the leaf-shaped sword people. These latter spreading out, Peake thinks, from the too wet forests of the mountains of central Europe, reached Scandinavia and Britain as well as the Aegean, and probably the clash was felt in Britain, as elsewhere. The legendary histories, at any rate, are full of evidences of war and all forms of trouble between southwestern England and the country from the Humber to Caithness, i. e. between the country in first contact with the coastwise route from the Mediterranean and the country in first contact with Scandinavia and the Low Countries.

We should probably imagine a succession of immigrants, traders, and invaders coming to Britain in the Bronze Age from both directions—from the Mediterranean basin and from the European plain. The amount of intercourse may have been quite considerable, and there may have been practically a circular route around Europe, for the European plain came into relations with the Mediterranean across what has since become Russia and Poland.

Iron Age Movements

THE BELGAE

There is some evidence to show that the last part of the Bronze Age witnessed a good deal of forest cutting, and with the advent of iron in eastern and southeastern Britain (about 450 B. C. perhaps) the country seems to have entered into relation with eastern and northeastern Gaul, say with the later Burgundy. It is quite possible that the first introduction of iron did not mean an invasion, but that the great inroad took place much later and was the coming of the Belgae to southern England. Whether the Brythonic-Celtic language came with the Belgae, or with iron, or before, we cannot say but we suspect that it is not very much older than the Belgae, and they came from near the region which may possibly have been responsible for early stages of its differentiation. Probably the Belgae

were men of strong build with fair hair and rather broad heads. The type would not be very unlike that of the Anglo-Saxons of centuries later, and we thus have a difficulty in deciding what is "Briton" and what "Anglo Saxon" in the population of eastern Britain.

It is probable that the west resisted these Brythonic or Belgic invaders whether it was already partly Brythonized or not. The Bronze Age civilization seems to have lived on for a long time in western Britain and in Ireland, and the clash between that older life on the moorlands and the iron-using people, apparently beginning to live in the valleys, is an abundant source of realistic Welsh folk tale. The evidences also of the finds of the earliest Iron Age (e. g. at Hengistbury and Glastonbury) are all for connections at that time with southwestern France and Armorica, not with northeastern Gaul. The contrasts in civilization between these western sites and such more easterly ones as Silchester and Aylesford seems very marked.

It is well to remember that the Brythonic or Belgic period was one of artistic achievement, as witnessed by the ornamental shields and many other objects exhibited in the British Museum. The Britons were no mere wild men of the woods.

THE ROMANS

Now the Romans enter upon the scene, and the taming of the lowlands is pushed forward by road building and the founding of cities. But though the English plain entered upon a period of city life and Roman culture, the far west, when touched, seems to have remained in a state of military occupation, while Ireland was not touched at all. Hereby came into being some of the distinctions which were going to set the different components of the British population apart for future ages.

The English plain began to learn Roman speech and Roman ways, and its older language became merely a dialect of kitchens and farmyards. The west had received, no doubt, an influx of the more warlike spirits from farther east and had had abundant cause to maintain its speech with pride, as a mark of its fidelity to its origins. At the same time, the language would be modified and much enriched by contact and exchange with the Roman soldiers and officials at the markets outside the camps, as well as along the lines of communication in Wales. Ireland was not touched by the Romans.

THE ANGLO-SAXONS

Before the Romans left, the population of the plains had been weakened, it is said, by the slaughter of many young men who followed the adventure of Maxen Wledig. When they did depart, and the Anglo-Saxons and other Germanic-tongued peoples arrived on the scene, the wonder is, not that they met with so little resistance, but that they met with so much. Gomme upholds the view that the invaders left London aside as beyond their

strength, and that theory, while far from established, at least avoids the old difficulty of understanding how London could have been an empty ruin for years and how it could have come about that London has such a characteristic and almost Roman tradition of its own. Behind London, the old stocks seem to have held out in the Chiltern Hundreds, and the memory of their special position persists in parliamentary procedure to this day. Their inhabitants still include a large number of the Mediterranean stock, and it is claimed that they have been distinct in many other respects, a district near by not needing Enclosure Acts of the eighteenth century because it did not then possess agricultural villages with communal cultivation. We shall perhaps not be far wrong if we tentatively connect such villages especially with the Belgic and Anglo-Saxon immigrants from the forest clearings of northwestern Europe.

The Anglo-Saxons spread their dominion along many river valleys and taught their language to the conquered folk, a de-Celticized peasantry whose leaders were dead or had fled. Of the coming of Dane and Norseman it is unnecessary to speak, save that one may point out the opposition of moorland and estuary. The British kingdom on the Pennine slopes and the Northumbrian Deira in the estuarine section of the Ouse, up to York or thereabouts, maintained a long struggle. There were also other cases of maintenance of the two traditions side by side. There is evidence that the British held the plain of Avebury for a century or more after Saxons had held the Vale of Pewsey.

THE WELSH PEOPLE

The far west, namely Wales and Damnonia, was long free from land invaders in any force, but it was open to sea rovers, just as was eastern Ireland. They found strong footholds here and there, as in Pembrokeshire and on the Liffey, but in several estuaries of Wales they seem to have had scant opportunity, and though one finds people who would seem to be their descendants along the coast, these people have become fused into the Welsh population. The old language, invigorated probably by its brusque contact with Latin, has persisted, and a tradition has grown up around it and around the generally successful resistance to the Anglo-Saxon tradition. The result is that descendants of Stone Age inhabitants of valleys off the moorlands, broad-headed folk who may be related to the ancient beaker-makers, and others who are probably coastal wanderers of the Bronze Age, besides sea rovers, and probably Flemish artisans, not to mention Huguenot weavers, have more or less fused into a Welsh people, proud of its language and of its tradition, much older in part than the language.

SOUTHERN BRITONS

A mixture of much the same elements, save the coastal wanderers of the Bronze Age who occur only in the west so far as is known, learned the

Teutonic speech of the post-Roman invaders of the English plain. Later on it absorbed its Norman conquerors and with them a large dose of Franco-Norman civilization and it developed a tradition around its partly Teutonic language. It was much altered by Roman influence and its people largely molded by Gallic civilization, but this much-mixed tradition is that which binds the English people together.

PERSISTENCE OF ANCIENT TYPES

In both groups the Mediterranean or, at any rate, the ancient long-headed stock or stocks are the broad foundation; in Wales, at any rate, they make their large contribution to the churches, to the poet's art, and to medicine; while in England, where disastrous events have destroyed the germs of peasant culture, they seem to become too largely the people of the slums. The type of the southern Bronze Age wanderers persists among western fisher-farmers, among the real fishing population, and thence emerges among ship owners, business organizers, and in the country's leaders. The type of the John Bull yeoman was a thickset variety of the Beaker people; with the decay of rural life and the growth of industrialism he has become rather rare, but traces of the Beaker people's type are widespread among the professional classes and the intellectual leaders. The Nordic type is an important constituent of the landed aristocracy and cannot live long under poor conditions in large towns. Its mighty influence seems to have contributed much to the prevalence of the country house and hunting life of rural England and thus to the retrogression of cultivation, which is such a serious fact at present. Yet with all this it is also a potent influence towards new ideas and new ventures; it is prominent in new "causes" and in the backwoods of the new lands. Indeed, with the progressive industrialization of Britain it was streaming away to the Far West and the Far South year after year. How to maintain it as a valuable factor of the nation's life, without at the same time exterminating the John Bull type or making life a burden for the still older elements of the people, is the anthropological setting of the internal polity of the English plain.

THE CELTIC TRADITION

How to maintain in mutual respect the two main traditions above sketched out, the English and the Welsh, is another problem prominent enough till the war began. That the Welsh tradition is poorer for its necessary stress on resistance is but too true. When the English tradition is ignorant in its contempt of the Welsh one, that is less excusable. The study of anthropology and of antiquities emphasizes the continuity of British tradition throughout, in spite of Normans, Anglo-Saxons, Romans, Brythons, and what not. It suggests that instead of looking upon the Celtic tradition as the poor keepsake of a conquered people, all but exterminated by the

Anglo-Saxon conquerors, we might with more truth look upon it as an heirloom, a precious ancient phase of our own tradition, to lose which would be to impoverish the British peoples forever. It does often happen that when a family acquires new and great wealth it is apt to cast out the furniture and the china it formerly used, in order to lay in a new stock at a fashionable shop. But it not infrequently happens, too, that as leisure brings refinement and artistic appreciation, the banished china is found to be precious Swansea ware, or the old armchair is Chippendale, and so the old possessions come into new honor. May it be so with the British tradition, as soon as the fever of industrialism and of its attendant wars has subsided.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Intermonthly Meeting of February. An intermonthly meeting of the American Geographical Society was held on Tuesday evening, February 12, at the Engineering Society's Building, 29 West Thirty-ninth Street. President Greenough presided. The lecture for the evening was entitled "Fighting Above the Clouds" by Professor Charles Upson Clark, Director of the School of Classical Studies of the American Academy at Rome. The lecture dealt with Italy's part in the war and was illustrated by lantern views and by motion pictures of the fighting in northern Italy.

NORTH AMERICA

Seattle, the Fourth Port of the United States. During 1917, according to the *Industrial News Survey* (published by the National Industrial Conference Board, Boston) for the week of December 31, 1917, to January 7, 1918, Seattle passed San Francisco in the value of her foreign trade, which amounted to \$600,000,000, thereby taking rank as the fourth port of the United States. This marked advance is due, of course, to the present abnormal conditions. War has revolutionized shipping routes. Supplies for the Russian armies constituted a large part of Seattle's exports (Abraham Berglund: *The War and Trans-Pacific Shipping*, *Amer. Econ. Rev.*, Sept. 1917). But her admirable geographical situation fits Seattle to maintain the position she has reached. Located at the most advantageous point in an extensive network of waterways, with sufficient depth of harbor and convenient dockage, within easy reach of a productive district, a position of local prominence was early assured her. Lumber and fish constituted the first important trade. Forest products were in demand along the entire west coast of North and South America. The cities on the treeless Peruvian and Chilean coasts and even far interior towns of the Andes called for the pine of Washington's forests. Railroads, when they came, made the entire Northwest a hinterland for Seattle, while no point was so well situated as a gateway to the gold and fur-bearing regions of Alaska. When commerce with the Far East was opened up Seattle was ready to offer the shortest route by which wheat and manufactured articles from the northern United States could be exchanged for the products of the Orient (see W. M. Gregory: *The Growth of the Cities of Washington*, *Journ. of Geogr.*, May, 1916). The heavy war shipments to Asiatic Russia have now made her America's foremost Pacific port.

The Labrador Eskimos. Of the widely distributed Eskimo race only the Central and North Greenland tribes still retain their indigenous culture unaffected or but slightly affected by contact with a higher civilization (see Diamond Jenness: *The Copper [or Central] Eskimos*, *Geogr. Rev.*, August, 1917). Westward the Alaskan Eskimo has greatly modified his mode of life during the last thirty-five years (*idem*: *The Eskimos of Northern Alaska*, *Geogr. Rev.*, February, 1918); on the eastern side of the continent, in South Greenland and Labrador, contact between the white man and the Eskimo is of comparatively ancient date. Some of its consequences for the latter group are presented by E. W. Hawkes in a memoir entitled "The Labrador Eskimo" (*Geol. Surv. of Canada Memoir 91: Anthropol. Series No. 14*, Ottawa, 1916).

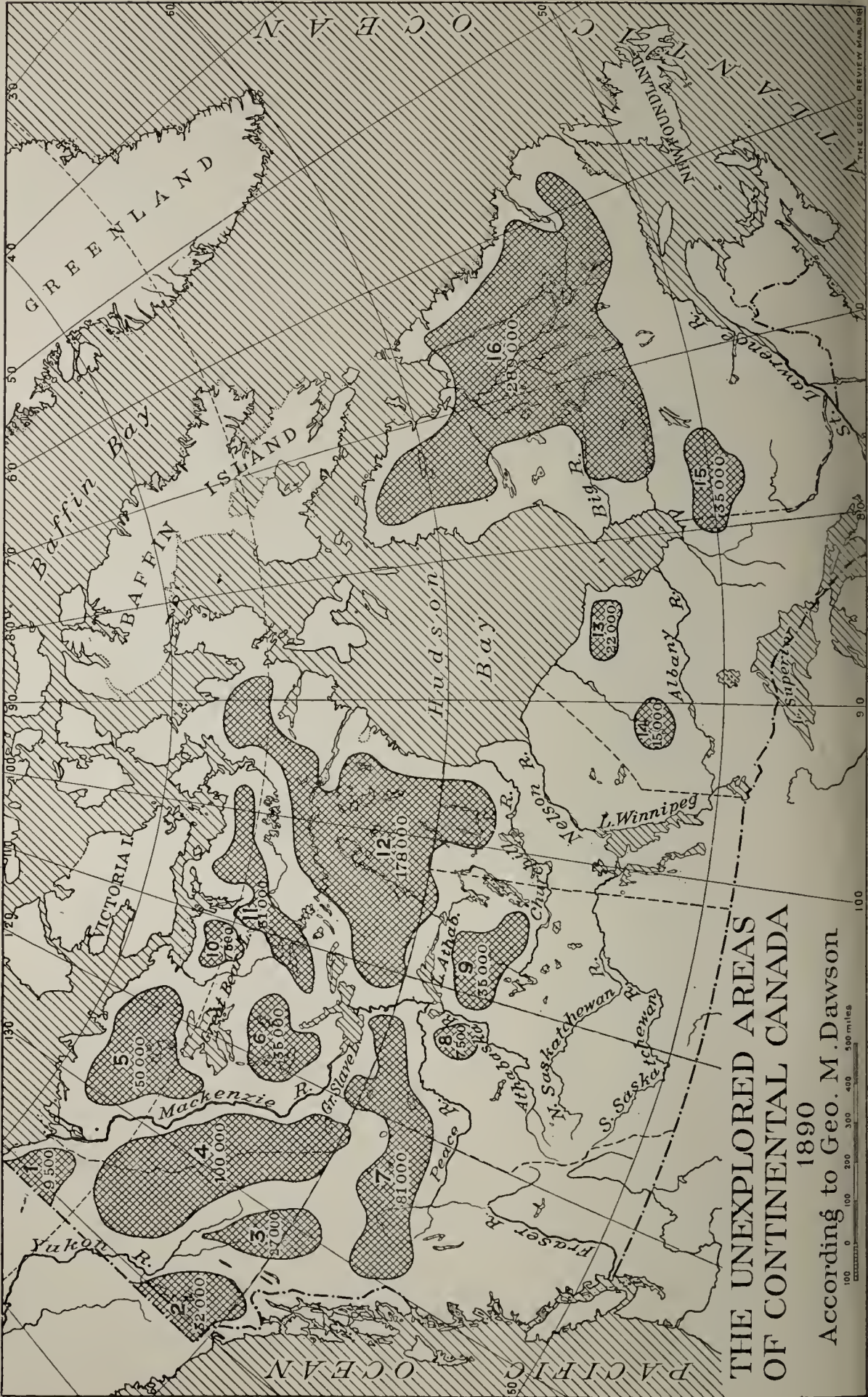
Today the Labrador Eskimo is found on the Atlantic seaboard from Hamilton Inlet northward, in groups about the trading posts and scattered along the shores of Ungava Bay, and dispersed along the desolate eastern shores of Hudson Bay. Practically all the Eskimos on the Atlantic coast of the peninsula are gathered into the six Moravian missions and are directly under mission control. To this circumstance they largely owe their existence, for in eastern Labrador the Eskimo has felt the rude contact with white civilization more keenly than elsewhere. When the French arrived in the Gulf of St. Lawrence they found the Eskimo ranging as far west of Mingan (64° W.). Between the newcomers, aided by the Montagnais Indians, whom they supplied with guns, and the Eskimos strife was constant and the Eskimos were forced to retreat. The same policy was maintained by the British until the wise Palliser, governor of Newfoundland in the latter half of the eighteenth century, adopted a conciliatory attitude towards them. When the Moravian Mission began work on the coast at this same period the Eskimos were estimated at 3,000. As they disappeared from the south—today with the exception

a few individuals in Sandwich Bay there is no pure-blood Eskimo south of Hamilton Inlet—the numbers at the missions increased. The mission stations, it should be remarked, were wisely placed in the best hunting grounds. By 1840 there were 1,034 eskimos at the four stations. Since that date the numbers have not varied greatly; they have fluctuated with epidemic and famine, but the general level has been maintained; in 1913 it was about 1,250.

The missions have protected the native from the exploiting white and they have encouraged him to continue to live in native fashion as regards food, clothing, etc. But change in religious and social ideas renders inevitable some change in material culture. The fundamental occupations remain the same; the details of their operation have been modified. The whale-boat has replaced the umiak; the bow and arrow has been superseded by the rifle; cod fishing has taken the place of salmon in native economy; the art of building snow houses is entirely forgotten south of Hopedale and is only retained in the north by judicious fostering; canvas has replaced skins for tents. Today the culture of eastern Labrador is hybrid; it is an Eskimo culture adapted to white ideas. To find a typical Eskimo group one must go into Hudson Strait or Bay.

The Unexplored Areas of Continental Canada. Synopses of our present state of knowledge of the topography of a given portion of the earth's surface are always valuable because they show at a glance, especially if represented on a map, what has been done and what remains to be done. A recent admirable example is Frank Cana's map of Africa, 1:20,000,000 (*Geogr. Journ.*, Vol. 38, 1911), which indicates the state of exploration of that continent in five grades of completeness. A similar inquiry with regard to Canada has recently been undertaken by Charles Camsell of the Canadian Geological Survey (The Unexplored Areas of Continental Canada, *Geogr. Journ.*, Vol. 48, 1916, pp. 249-257). The investigation is wisely restricted to continental Canada inasmuch as insular Arctic Canada, as Stefansson's recent discoveries show (see below), is not entirely revealed as yet and even the coasts of long-known islands are not laid down accurately or are totally undetermined (for example, Southampton Island, see *Bull. Amer. Geogr. Soc.*, Vol. 42, 1910, map facing p. 84, and Vol. 45, 1913, map on p. 576; and Baffin Island, for most of the west coast of which we are still dependent on the Eskimo maps published in the narrative of Hall's second expedition). To determine the unknown areas Mr. Camsell assumes a strip 15 miles wide on each side of an explored route to be known. The areas remaining between the resulting 30-mile bands representing the network of explored routes constitute the unknown areas. The author does not mean to imply that these areas have never been visited; but the travelers who entered or crossed them made "no reasonably accurate surveys" or left "no records of the geography, life, or general character of the region traversed." No area of less than 4,000 square miles is included. The areas were, according to a communication from Mr. Camsell to this Society, originally plotted and measured planimetrically on the standard base map of Canada, 1:2,217,600, published by the Department of the Interior, Ottawa. A reduction was then made and sent with the article. The map was, however, not published in the *Geographical Journal*. Subsequently Mr. Camsell on request kindly furnished this Society with an approximate copy on the base map of Canada in 1:6,336,000, and from this the accompanying map (Fig. 2) was made. These details are entered into in order to afford a criterion as to the method followed.

Mr. Camsell's paper naturally calls to mind a similar inquiry made twenty-six years before by the late Dr. George M. Dawson, Director of the Geological Survey of Canada (On Some of the Larger Unexplored Regions of Canada, *Ottawa Naturalist*, May, 1890, 12 pp., with map in 1:27,000,000; reprinted, with map, as Appendix 1, pp. 277-289, of Warburton Pike's "The Barren Ground of Northern Canada," London, 1892). In this the known strip of territory on each side of the traveled routes was taken to be 25 miles wide. "All traveled routes along which reasonably satisfactory explorations have (had) been made and of which fairly accurate route-maps are (were) in existence" were taken into consideration. The smallest area outlined is 7,500 square miles in extent. A comparison of the two synopses is of interest. Dawson's map is reproduced herewith (Fig. 1) on the same scale and base as Camsell's. It should be remarked that Dawson's published map is on a small scale and poorly engraved, the underlying base being quite inaccurate in geometrical outline. However, the original plotting and computation were evidently made on a large-scale map, which was displayed by the author at the lecture of which the paper is the printed form. In view of Dr. Dawson's well-known accuracy, no doubt need therefore be entertained as to the correctness of the figures which he gives for the unexplored areas. His areas, and Mr. Camsell's, are here as far as possible correlated in tabular form. The numbers of the various blocks are those assigned them in the original papers and correspond with the numbers on Figures 1 and 2. Equivalent areas are listed as far as possible opposite each other.



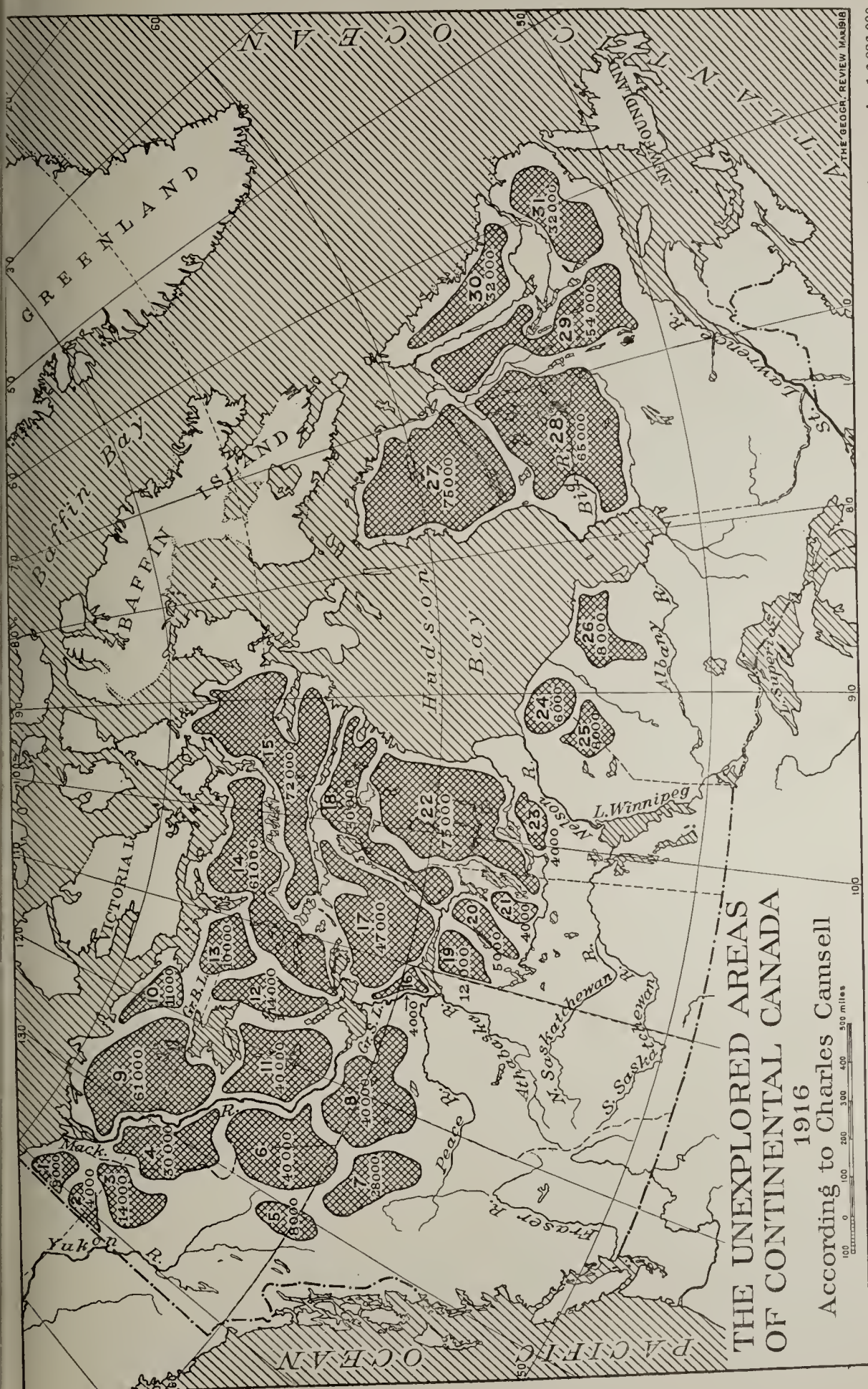


FIG. 2—The unexplored areas of continental Canada in 1916, according to Charles Camsell. Scale, 1:30,000,000. (Copied from manuscript map in 1:6,356,000 furnished the Society by Mr. Camsell.)

UNEXPLORED AREAS OF CONTINENTAL CANADA

<i>Dawson, 1890</i>		<i>Camsell, 1916</i>	
AREA	SQ. MILES	AREA	SQ. MILES
1 N of Porcupine R.	9,500	1 N of Porcupine R.	8,000
2 SW of Lewes and Yukon Rs.	32,000	2 W of Porcupine R.	4,000
3 Between Lewes, Pelly, and Stikine Rs.	27,000	5 W of Dease and Francis Rs.	8,000
4 Between Pelly and Mackenzie Rs.	100,000	{ 3 W of Peel R.	14,000
7 Between Stikine-Liard and Skeena-Peace Rs.	81,000	{ 4 E of Peel R.	30,000
5 NW of Great Bear L.	50,000	{ 6 N of Liard R.	40,000
6 S of Great Bear L.	35,000	{ 7 W of Ft. Nelson R.	28,000
8 Between lower Peace and Athabaska Rs.	7,500	{ 8 N of Peach R.	40,000
10 NE of Coppermine R.	7,500	{ 9 NW of Great Bear L.	61,000
11 N of Great Slave L. and Back's R.	31,000	{ 10 N of Great Bear L.	11,000
12 Between Back's R. and Hudson Bay	178,000	11 S of Great Bear L.	40,000
9 SE of L. Athabaska	35,000	12 W of Coppermine R.	14,000
13 NW of Attawapiskat R.	22,000	13 NE of Coppermine R.	10,000
14 Headwaters of Severn R.	15,000	14 N of Great Slave L. and Back's R.	61,000
15 SE of James Bay	35,000	{ 15 S and E of Back's R.	72,000
16 Interior of Labrador	289,000	{ 17 N of L. Athabaska	47,000
		{ 16 E of Slave R.	4,000
		{ 18 E of Dubawnt R.	30,000
		{ 22 E of Kazan R.	73,000
		{ 19 S of L. Athabaska	12,000
		{ 20 E of Cree R.	5,000
		{ 21 W of Reindeer L.	4,000
		{ 23 S of Churchill R.	4,000
		{ 24 SE of York Factory	6,000
		{ 25 NE of Island L.	8,000
		{ 26 SE of Winisk R.	8,000
		{ 27 W of Ungava Bay	75,000
		{ 28 N of Eastmain R.	65,000
		{ 29 E and S of Kaniapiskaw R.	54,000
		{ 30 E of George R.	32,000
		{ 31 S of Hamilton R.	32,000
Total, in round numbers,	950,000	Total, in round numbers,	900,000

A glance at the two totals as well as at the maps shows that, apparently, after a lapse of a quarter-century the unexplored area is hardly less than it was before. This is of course due to Dr. Dawson's assuming a wider strip as known than Mr. Camsell. A measurement of the perimeters of Mr. Camsell's areas on his map in 1:6,336,000 has shown that this factor accounts for 250,000 square miles. The comparable totals are therefore, Dawson, 950,000; Camsell, 650,000—which better expresses the progress of exploration in the intervening time. The main inroads that have been made into the unknown areas of 1890 relate to the upper Yukon region, where the development of the Klondike gold fields has brought scientific exploration in its train, and to Labrador and the block between Great Slave Lake-Back's River and Hudson Bay, both of which have since been crossgrained by route surveys.

The present unexplored areas belong, according to Mr. Camsell, to three types of country. By far the largest portion—two-thirds—lies in the Laurentian Plateau, that vast area of ancient rocks that extends in U-shape around Hudson Bay from the Atlantic coast of Labrador to the line of great lakes consisting of Winnipeg, Athabaska, Great Slave, and Great Bear—Suess's "Canadian Shield." Its rocky, lake-studded surface makes it unsuited to agriculture, even where climatic conditions are not prohibitive, as they are in the north, where the coniferous forest gives way to the open Barren Grounds—the American tundra. Mineral resources are the main asset of this region. The

second type of country is represented by the great central plains of the continent, which here, in their northern section, narrow down from a width of 1,000 miles in the latitude of Winnipeg to some 200 miles across the middle Mackenzie. About 110,000 square miles of the unexplored regions on both sides of the Mackenzie are of this type. This includes the areas in Figure 2 numbered 8 and 11 and parts of 4 and 9. Some of this area is probably suited to agriculture, especially the block lying north of the Peace River and west of Great Slave Lake. The third type is that of the Cordillera. This includes the blocks lying west of the Fort Nelson, Liard, and Mackenzie Rivers numbered 1, 2, 3, 5, 6, 7, and the greater part of 4 and covers some 130,000 square miles. The chief value of this area probably lies in its mineral resources, although, because of the disturbances incident on mountain structure, it is less easy to forecast its geology than is that of the Laurentian Plateau.

SOUTH AMERICA

Settlement of the Amazon Basin Through Reformed Methods of Rubber Gathering. According to a statement in an article on "Brazil's Expansion of Manufacturing," in the January, 1918, number of *The Americas* (published by the National City Bank of New York) the Amazon states of Brazil are attempting to reform the prevailing system of gathering rubber. At present a company sends its expeditions up along a stream carrying all their supplies with them. The rubber on each side of the rivers is exploited, but for only a short distance from shore. Nothing but temporary quarters need be erected, except at river junctions or other strategic points. The reform aims to establish permanent colonies where land would be cleared and provisions raised. Such a plan should make it possible to smoke rubber under better conditions and so improve the quality of the Pará shipments. If the scheme were carried out successfully roads and railroads would soon be required. This would result in the opening up and extensive development of that vast interior country upon which civilization has secured so feeble a hold. In the four centuries during which Europeans have repeatedly penetrated the remote regions of the Amazon Basin, they have succeeded in establishing only attenuated lines of riparian settlements, while the wide interfluvial areas have remained undeveloped. The reform being attempted is one of various projects by which Brazil hopes to obtain permanent settlements in her interior provinces.

Cheese Production, A New Industry in Argentina. Though the people of Argentina own nearly 30,000,000 head of cattle (about four per capita) and use thousands of square miles for pasture lands, there has been very little dairy business in the country until recent years. Except in the cities milk and butter were almost unknown. European countries supplied the foreign residents with condensed milk and tinned butter, while cheese came from the same source, in largest quantities from Italy. The Argentine herds were used almost solely for their meat, hides, and bones and for the supply of draft oxen. According to the *Revista de Economía y Finanzas* of Buenos Aires for November 5, 1917 (p. 16), this condition has suddenly changed, especially as regards the production of cheese. The native factories produced 7,800,000 kilograms more in 1917 than in 1913. Last year the balance swung from large importations to considerable exportations. While in 1916 there were 1,421,246 kilograms of cheese imported and only 227,711 kilograms exported, in the first half of the past year 1,399,101 kilograms were exported and but 249,432 kilograms imported. This situation has been brought about partly by the abnormal trade conditions created by the war. Europe has been unable to supply the foreign markets with dairy products. According to *Commerce Reports* for November 26, 1917 (p. 772) European countries sent just 99 pounds of cheese to the United States in August last as against a monthly average in 1914 of about 5,300,000 pounds. The United States is now exporting this commodity to fifty foreign countries. Argentine cheese producers, already supplying the demands of their domestic market, are taking advantage of this revolution in trade conditions and are replacing some of the European exporters. In August, as shown by the report mentioned, 448,000 pounds of Argentine cheese came into the United States. The year before not a single pound had come.

The climate of Argentina is not well suited, in some respects, to the dairy business. The supply of natural pasturage is made uncertain by recurring periods of severe drought, such as that of 1916. The rainfall on the pampas is so light that grasses are usually hard and coarse. There are sudden extreme fluctuations of temperature and humidity. But in spite of these disadvantages the more intensive development of the great *estancias*, introduction of the best foreign breeds of cattle, denser settlement of rural districts, great improvement in transportation, and the demands of domestic and foreign markets have made possible the rapid growth of the industry. Aside from its commercial aspect

this is significant in that it marks the passing of the primitive nomadic pastoral life of gaucho days and the advent of a settled population with its characteristic industries.

EUROPE

The Climate of the Western War Zone. The importance of meteorological controls over military operations has naturally stimulated interest in the climate and weather of the various war zones. The interest in the climate of Belgium and of eastern France has been greatly intensified since the advent of American troops in Europe. Questions concerning the cold and the heat, the snow and the rain on the western front are more and more frequently asked. In order to answer such inquiries, Mr. P. C. Day of the U. S. Weather Bureau has prepared some "Notes on the Climate of France and Belgium" (*Monthly Weather Rev.*, October, 1917). Special emphasis is laid upon comparisons between conditions abroad and those in the United States. Temperature and precipitation curves and charts are given for selected stations in France, Belgium, and the United States, and numerous tables carry the comparisons farther. The essential climatic facts for the western war zone are the relatively warm winters, considering the high latitude; the relatively cool summers; and the moderate annual amount of precipitation, with frequent rainfalls. The coldest weather on record in northern France ranges from about 0° F. to -10° F., but there is no such intense cold as is characteristic of the interior and northern portions of the United States. Again, in summer, the mean temperatures (July and August) are only 63° to 65°, and in most of northern France and in Belgium single temperature readings of 100° have never been reported.

The rainfall on the lowlands is between 20 and 30 inches. In the Vosges it reaches 60-70 inches. A fairly even distribution through the year is the general characteristic, with a not very well defined maximum in fall and early winter. Snow may be expected from November to April, fairly frequently, but does not often attain any considerable depth. In the mountains the snowfall is much heavier. At Brussels, snow occurs on about 25 days a year; at Paris, on about 15 days.

A brief description of the climate and weather of this same area, with special reference to military operations, may be found in a recent article by the undersigned, entitled "The Weather and the War" (*Journ. Milit. Service Instn.*, Vol. 61, Sept.-Oct., 1917, pp. 145-155).
R. DEC. WARD

AUSTRALASIA AND OCEANIA

Drought in the Gilbert Islands. Serious drought has prevailed in the Gilbert Islands during the past year (*United Empire*, Vol. 8, N. S., 1917, p. 548). The islands (whose annexation by Great Britain in 1915 was noted in the Feb., 1916, *Review*, p. 145), lying in the mid-Pacific athwart the equator, normally enjoy a good rainfall, but the recurrent periods of drought are a bar to their economic development. Drought kills the coconut tree and cuts down the export of copra, the chief item of the insular trade. Continued drought has had even more serious consequences, the inhabitants being at times put to straits to procure sufficient water to support life. To meet emergencies the local government has lately completed on Ocean Island a system of cement cisterns, whose speedy construction, expedited as a result of native forecasts, now assures the supply of the government staff. The natives also have been encouraged to spend upon tanks a part of the money derived from the sale of their lands to the Pacific Phosphate Company. The company, however, has secured them against entire destitution by the erection of a condensing plant where water may be bought in case of drought (Gilbert and Ellice Islands Protectorate: Report for 1914-1915, *Colonial Repts. No. 884*, London, 1916).

An Extraordinary Rainfall Record from the Hawaiian Islands. Cherrapunji, Assam, enjoys world fame for its extraordinary rainfall, averaging 460 inches per annum. In *Science* for November 23, 1917, Douglas H. Campbell calls attention to a rival nearer home (An Extraordinary Rainfall Record, pp. 511-512). Kauai, most northerly of the Hawaiian Islands, boasts a station whose average rainfall for the last five years (1912-1916) is 500 inches. This station is on the summit of Mt. Waialeale, 5,705 feet above sea level. Precipitation is almost constant, and the surface of the region is entirely bog, either open or supporting a growth of low moss-covered trees.

POLAR REGIONS

Discovery of New Islands in the Arctic Archipelago by Stefansson. Two despatches from Stefansson received at the end of last year (from Melville Island, February 17, 1917, and Herschel Island, November 10, 1917, *New York Times*, December 29

and 28, 1917, respectively) tell of important new discoveries that the explorer has made since he was heard from last. These continue the report of his activities from May, 1916, when he stood on the threshold of the new land discovered in June, 1915 (see *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 766-769, and *Geogr. Rev.*, Vol. 2, 1916, pp. 470-471). Proceeding along its western coast he found its northern tip, which he named Cape Malloch, to lie in about 79° N. and 113° W. (see map, Fig. 1). On a later stage of his journey the other corners of this land, which proved to be an island, were located and named as follows: northeastern tip, Cape Mamen, approximately $78^{\circ} 30'$ N. and 108° W.; southeastern tip, Cape Mackay, $77^{\circ} 50'$ N. and 110° W.; southern tip, Cape Beuchat, approximately $77^{\circ} 15'$ N. and 113° W.; southwestern tip, Cape Murray, $77^{\circ} 55'$ N. and $114^{\circ} 30'$ W. This places the new island between Prince Patrick and Ellef Ringnes Islands. The names were evidently given in honor of men of the expedition who lost their lives when trying to reach land after the *Karluk* sank in January, 1914. Continuing in a northeastern direction, presumably past Cape Isachsen of Ellef Ringnes Island, a second new island was discovered on June 13, 1916. The location of its three salient corners, southwestern, northern, and southeastern, are given as $79^{\circ} 50'$ N. and 102° W.; $80^{\circ} 12'$ N. and 100° W.; $79^{\circ} 40'$ N. and 99° W. It therefore lies between Ellef Ringnes and Axel Heiberg Islands. Stefansson also reports the existence of several smaller islands between the second new island and Axel Heiberg Island.

Turning southward from here the explorer's route presumably lay through Hassel Sound, the strait separating Ellef Ringnes from Amund Ringnes Island. Hassel Sound he found to be 15 miles wide at its narrowest part: it is shown as about 5 miles wide on the general map accompanying Sverdrup's account of his expedition of 1898-1902 ("New Land," 2 vols., London, 1904), but this representation was intended to be provisional only, as no member of the expedition had traversed it. Continuing, Stefansson entered an area lying on the border of the fields of work of previous expeditions. Such areas are always likely to be inaccurately represented, and Stefansson evidently did not find it otherwise. On April 29, 1853, Sherard Osborn of the Franklin Search expedition of that year, sighted what seemed an extensive land 30 miles or more to the northwest of the northwestern extremity of Bathurst Island. On the maps this figures as "Finlay Land," lying in about 77° N. and 105° W. On April 27, 1901, Isachsen of the Sverdrup expedition and his party saw from the southern extremity of Ellef Ringnes Island a land to the west that extended southward "as far as the eye could reach." They named it King Christian Land and placed it in about $77\frac{3}{4}^{\circ}$ N. and 102° W. on their map, joining it in hypothetical outline with Finlay Land, thus creating an island some 80 miles long from northeast to southwest and 45 miles wide. This island Stefansson's explorations have now again broken up into its constituent parts. He reports the most southerly point of King Christian Island to lie in $77^{\circ} 41'$ N. and the greatest east-and-west diameter of the island to be 15 miles. The greatest diameter of Finlay Island he says is about 12 miles, and the maximum depth of the sea between the two islands 172 fathoms. The existence of a small island between Paterson Island ($76^{\circ} 50'$ N. and $104^{\circ} 15'$ W.) and Finlay Island is also reported.

Proceeding to the west a third new island was discovered on August 3. Its northern tip lies in approximately $77^{\circ} 55'$ N. and $108^{\circ} 10'$ W.; its southern tip in $77^{\circ} 9'$ N. and 107° W. This island therefore lies southeast of the first new island. A month was spent on it, to September 9. The east coast of the first new island was then visited and followed southward and westward around Capes Mackay and Beuchat until Cape Murray was reached on September 23. From here the route probably skirted the northeastern end of Prince Patrick Island and the northern shore of Melville Island until Liddon Gulf was reached on October 16. Stefansson's later movements can only be conjectured. In his second despatch he speaks of an advance made over the sea ice from the northern coast of the first new island, in the spring of 1917. He proceeded from $78^{\circ} 30'$ N. and 110° W. and reached a point 140 miles north-northwest of this. Between these two points the sea bottom "showed no gradual or other slope away from the land. The depth varied from 444 to 570 meters. There was strong ice pressure but little ice motion as compared with the sea either west of Banks Island or north of Greenland."

Stefansson next speaks of being at Barter Island (off the Alaska coast, 144° W.) on September 13, 1917. During a westerly gale his vessel went aground and was not re-floated until September 27. This date the explorer considered too late for an attempt to get around Point Barrow and thus out of the Arctic seas, so he evidently turned east to winter at Herschel Island, whence the despatch dated November 10 was sent. A recent despatch to the *Toronto Globe* (reprinted in the *New York Times* of March 1) showed him still there on January 31 of this year, planning a sledge expedition over the sea ice north from Cross Island, Alaska (148° W.), and counting on being carried by the westward current to Wrangell Island on the Siberian coast.

The importance of Stefansson's latest work is patent. It has done much toward



FIG. 1A—Eastern continuation of Fig. 1.

clearing up the question whether the unknown area north of Alaska harbors a land complex or is part of the Polar Basin. His advance northwestward from the first new island, together with his remarkable ice trip over the Beaufort Sea in 1914, his westward loop in 1915 between Banks and Prince Patrick Islands, and MacMillan's trip in 1914 to the supposed site of Crocker Land would all seem to indicate that no land exists west of the known limit of the American Arctic Archipelago. Indeed, his discoveries would seem to define this limit more sharply; his first and second new islands lie on the direct line connecting the outer coasts of Grant Land and Prince Patrick Island, a line which in its simplicity recalls the abruptness with which other archipelago-beset platforms in regions of mediterranean structure—to which the Polar Basin in all probability belongs—break off toward the adjoining seas. However, such conclusions must await the publication of the final reports, to which the scientific world will look forward with the greatest interest.

A Narrative of the Crocker Land Expedition. Lieutenant Fitzhugh Green accompanied the Crocker Land Expedition in the capacity of engineer and physicist. He narrates his experiences in five recent issues of the *United States Naval Institute Proceedings* (September, 1917–January, 1918). The expedition touched Greenland in August, 1913, at Cape York (76° N.), the southern limit of the Whale Sound Eskimos. Thence along the coast stops were made to pick up Eskimo families and dog-teams for the forthcoming work. Proper stops were known to the Eskimos, for the tribal settling-places—as they should be termed rather than settlements—are well established. In the seasonal course of the food-quest migrations, southward for the seal and small game, northward for the caribou and bear, whose skins are as important as their meat, resort is made to the old stopping places. Usually, they are selected on favorable topographic sites, on protected spots at the foot of southern exposures. Abundant remains testify to the antiquity of habitation.

With other stops to secure food for the winter the expedition reached Smith Sound but ice conditions prevented progress into Flagler Fiord, the proposed winter headquarters. Here other expeditions had found open water, but in the three summers of Green's stay in the Arctic the ice barrier never lifted from the north of Smith Sound. This is the hard lesson of the North, "one season or two, or even three (are never a criterion of ice conditions in any other season." In this contingency winter quarters were established at Etah (Foulke

Fiord), the nearest point convenient of access to Ellesmere Island and the main objective of the expedition—Crocker Land.

At Etah the physicist's first care was the erection of two meteorological stations, one at the base, the other on the plateau 2,000 feet above. When the narrative was written the records were not available; the narrator, however, comments on the powerful control of wind direction. Two main types of weather were experienced. With the north wind was cold, clear weather; where the air descended the steep plateau walls adiabatic warming raised the temperature "a merciful amount"; down the fiords the pristine iciness was unmitigated. A south wind invariably meant cloudy weather. Under a swell from the south, the ice cracks, exposing water surfaces of comparatively high temperature from which arises warm air, whose vapor condenses to form an insulating cloud barrier. At such times the weather would be warm and snowy.

Towards the end of the year (1913) preparations were made for the advance on Crocker Land. With the advent of the December moon a party set out to lay caches. By following the coast until solid floes gave a fairway to the opposite land Smith Sound was crossed without difficulty and a supply base made at the ill-famed Cape Sabine. At the base sledges were made and other equipment got ready, work in which the Eskimos instructed in the use of European tools proved highly skillful. On February 7, 1914, the party set out for the great objective. The first attempt failed: a second and successful start was made a month later under the low March sun. The route lay across the difficult crevassed ice of the plateau of Ellesmere Island, down the 5,000 feet of its abrupt descent to Bay Fiord; thence to Cape Thomas Hubbard (see the map accompanying the preceding item). From here on April 15 MacMillan and Green set out across the Polar Sea in search of the phantom land. The going was wretched, the apprehensive natives mutinous. Seventy miles out the white men were cheered by a faint shadow on the northwest horizon. "The Eskimos shook their heads. 'Puksuaq,' they said—it's just mirage." And so it seemed, for in all the speed of our pursuit, the specter grew no nearer. Peary placed Crocker Land 130 miles out. At 105 miles we cached most of our food and ran for it. Two marches more placed us beyond the 150 mile mark. The day was perfect, crystal, clear horizon, and no wind. We climbed the highest berg and saw nothing." Yet on return to land the illusion appeared so realistically that "had we not been out, we too should have announced its discovery and urged its exploration." The farthest point reached was subsequently determined to be $82^{\circ} 30' N.$ and $108^{\circ} 22.5' W.$ Bad weather curtailed attempts at exploration of the coasts southwest and east, and the party went back as it had come, enjoying on the return splendid views of the white ranges of Axel Heiberg Island, discovered by Sverdrup in 1901. In all 1,300 miles were covered in three months. Much game was seen, and at the camp in Bay Fiord bituminous coal was struck.

During the second summer (1914) Green's scientific work included wireless experiments with radio kites and surveying, the latter including a hydrographic survey of Foulke Fiord. During the succeeding winter he was also able to add further to the map of northern Greenland by a survey of the coast as far north as Hall Basin. Results of this survey showed the work done by Hall, Kane, and Peary to be substantially correct with the exception of that part of the coast between Capes Calhoun and Constitution.

Close of the third summer (1915) saw the arrival of the first relief ship, the *Cluett*; the ill-luck attending her has been recorded in the *Review* (Vol. 1, 1916, pp. 145-146, and Vol. 2, 1916, p. 65). On an attempt to secure relief Green and two other members of the expedition later (January, 1916) made their way into South Greenland. Their long journey was carried out under the usual hardships attending Arctic travel, but for the scientific observer there were compensations. A few marches after rounding Cape Holm, the Devil's Thumb of the earlier explorers ($74\frac{1}{2}^{\circ} N.$), the little party entered South Greenland, Greenland modified by Danish influence, a region of great interest for geographers and ethnographers.

Here, at the first settlement, Etusalik, "all was different": here the Eskimos have lost the old arts. "They cannot build snow houses or real rock igloos—have lost the art these four generations. Lumber can be purchased from southern trading stations, and sod-covered walls protect the outside of their wooden huts. They know not how to fashion soap-stone lamps, for the simple reason that the nearest missionary supplies excellent iron kettles. They wear sealskin breeches which are neither handsome nor warm, and sell their bearskins to the traders. With the profits they can buy guns and ammunition."

The sharp change at Cape Holm marks the beginning of a sequence of progressive cultural changes but these seem to depend not only on exterior human interference but also on geographical influences, most particularly climate, which limits the time possible for the various native occupations. In Greenland, however, white intervention arouses

particular interest because of the policy by which it is controlled. Nearly half a century ago the Danish Government closed the country to outsiders, in part for economic reasons but chiefly for the protection of the natives and for the maintenance of native initiative.

Besides the general interest in this humanitarian policy Greenland has peculiar interests for the United States. The treaty transferring the Danish West Indies to the United States contained a clause recognizing Denmark's right to extend her economic and political sphere over the entire island. The clause aroused much discussion (see Peary's letter to the *New York Times*, September 11, 1916), for the future significance of Greenland, as American explorers have pointed out, runs along economic and strategic lines. Already the country has a considerable export trade from the products of hunting, fishing, and mining, and development of the last in particular has only just begun. Lying between Europe and North America Greenland occupies a strategic location doubly significant by the splendid secure fiord harbors (Godhavn is open, at least in certain seasons, ten months of the year); and there is coal, graphite, and petroleum. "Greenland is going to have a chapter in naval history."

WORLD AND LARGER PARTS

The World's Food Supply. Under this title G. B. Roorbach outlines salient facts of food production in relation to the present situation (*Annals Amer. Acad. Polit. and Social Sci.*, Philadelphia, November, 1917). While a great variety of products enter into the world's supply, the number of staples is limited: they are the cereals rice, wheat, millet, rye, barley, the chief foods both in production and food value; corn, oats, and beans; potatoes; sugar; and meat, the least considerable of the staples. With the exception in part of sugar and rice the north temperate zone is the great producer of the staple foods, and Europe—a fact apt to be obscured by the industrial predominance of the continent—is the greatest producer of all, excluding rice, millet, and corn. In 1913 Europe contributed 65.4 per cent of the world's supply of wheat, oats, rye, barley; 90.5 per cent of the potatoes; 43 per cent of the sugar; 31.8 per cent of cattle. Even the most densely peopled and highly industrial countries produced more than half their own requirements. The percentage ratio of production to requirements for various countries is: United Kingdom, 53; Belgium, 57; Germany, 88; France, 93; Austria-Hungary, 98; United States, 100; Russia, 110; Canada, 123; Argentina, 148.

We are probably more familiar with Europe's large figures of food importation. If we add those for home production the seriousness of the European food situation needs little further demonstration. Naturally this is greatest in the case of wheat. On the average in the last three pre-war years (1911-13) the Western Allies imported 344,000,000 bushels of wheat, an amount about three-fifths of their total consumption. The neutral European countries imported 67,000,000 bushels, about one-third of their consumption. Russia, leading in the world's export, is now ruled out as a source of supply. Rumania, Bulgaria, Turkey are tributary to the Central Powers; according to pre-war reckoning they would make up the greater part of the German deficiency. The United States and Canada ranked next to Russia in the 1911-13 figures and Argentina next, but unfortunately the last, with great fluctuations of production, is not a dependable source. India and Australia together exported about as much as Canada, but Australia is now much hampered by shipping difficulties.

In corn (maize) production the United States is unique, accounting for over 70 per cent of the world's supply. Cultivation and consumption as human food are both susceptible of increases: corn is the food lending itself best to food conservation measures. Rice, the great staple of the East, is comparatively unimportant in the food supply of the West, though its food value is very high. It is, however, noteworthy that production in the United States has been considerably increased. This is also the case with another great product of the East, the soy bean. During war time meat production always diminishes rapidly. In the European countries wealthy enough to indulge in meat eating the situation is now very serious. Moreover the sacrifice of cattle is accompanied with loss of dairy products. Exportation from the United States in 1916-17 has been notable; meat exports increased fourfold, and enormous expansion was shown in butter, cheese, and condensed milk. While the late growth of meat consumption has greatly outdistanced the growth of production, the very great production of the United States should be remarked. It amounted to between three and four times the combined output of Australia, New Zealand, Argentina, and Canada. It is by the United States, with a normal excess of production of wheat, corn, barley, rye, meat, and potatoes and with a comparatively short voyage to Europe, that the great effort of food production and conservation must be made to meet the crisis in the world's food supply.

PHYSICAL GEOGRAPHY

Fog Formation. The formation of fog and mist, with reference to forecasting the occurrence of these phenomena, has been considered by Major G. I. Taylor of the Royal Flying Corps (*Quart. Journ. Royal Meteorol. Soc.*, Vol. 43, 1917, pp. 241-268). "Smoke fogs" require a very light wind and an inversion of temperature near the ground so that the fog shall not be dispersed vertically by turbulence or by convectional currents. The second of these conditions practically limits the formation of smoke fogs to winter.

Fogs which consist of water drops are the most frequent and the most complicated. Condensation is due either to cooling or to the mixture of two masses of air having different temperatures and containing different amounts of water vapor. Major Taylor spent six months during the summer of 1913 on the whaling ship *Scotia*, carrying out scientific work on the Grand Banks of Newfoundland. In his study of fog he was able in certain cases to secure data from the air above the surface of the water by means of kites. In every one of these cases the fog was due to air blowing off warm water onto the colder water of the Banks. The author is of the opinion, however, that cold air blowing over warm water may also give rise to fog. Observations of the height of these Grand Bank fogs showed that the fogs are often so shallow that the top of a ship's mast is in bright sunlight when it is impossible to see more than 80 or 100 feet along the deck. Occasionally, however, the vertical thickness of the fog may reach 3,000 feet. A third class of fog includes those formed on land, at night, during light winds or in calms. These are generally known as radiation fogs.

Major Taylor, who is attached as meteorologist to the Royal Flying Corps, gives special attention to the problem of fog forecasting. This is, of course, a very practical matter in aviation. He has prepared a "fog prediction diagram," in which the air temperatures and depression of the dew point are shown by the abscissas and the ordinates respectively. A series of lines is drawn across the diagram indicating conditions favorable or unfavorable for fogs during the night. The author believes that the use of this diagram should lead to a considerable improvement in local radiation fog forecasts in the warmer months. In winter, at temperatures below freezing, the wet-bulb readings are, of course, not reliable.

R. DEC. WARD

Effect of Short-Period Variation of Solar Radiation on the Earth's Atmosphere. H. Helm Clayton, long a student of weather periods, has recently demonstrated the connection between short-period changes of the sun's heat and terrestrial temperatures (*Smithsonian Misc. Colls.*, Vol. 68, No. 3, May, 1917). Clayton has compared the variations in solar radiation found by Abbot, Fowle, and Aldrich in 1913 and 1914 with temperature and pressure departures for many stations over the world. The temperatures of the tropics rise and fall two days behind the increases and decreases of sun's heat. Corresponding lowering of pressure reaching a minimum in a day after the maximum temperature, occurs as the expanded air apparently flows polewards in the upper levels. This overflow from the tropics seems to go chiefly to the established sub-permanent anticyclones over the coldest parts of the oceans in about latitude 35°, for there the pressure rises most. With this rise there is a fall in temperature in the eastern part of the anticyclone and a rise in the western, on account of the increased strength of the winds. Four to five days after the increase in solar radiation there appears to be a tendency to minimum pressures in sub-polar low-pressure centers of action. It seems to be true for the earth, therefore, that an increase in sunlight reduces the pressure in the low-pressure areas and raises that in the "highs." Over North America the result thus may be increased cold in winter and heat in summer.

That this effect operates on the smaller extra-tropical cyclones and anticyclones has been shown by M. A. Veeder and Ellsworth Huntington (*Geogr. Rev.*, Vol. 3, 1917, pp. 188-211 and 303-316).

There seems to be in both hemispheres an anti-clockwise elliptical movement of the centers of highest temperature departures. This movement, probably accompanied by movements of the centers of action, seems to be responsible for the masking of the effect of solar variations on the weather of a single place. Analyzing the solar changes and, independently, the temperatures of Buenos Aires, a coincident period of 22 days has been found, with a possible minor one of 11 to 14 days. As the period of solar rotation is 27 days this seems to be independent of the successive reappearances of sunspots.

CHARLES F. BROOKS

GEOGRAPHICAL NEWS

PERSONAL

PROFESSOR R. F. GRIGGS of Ohio State University gave a lecture on February 8 before the Geographic Society of Chicago on "The Mt. Katmai (Alaska) Explorations."

DR. JESSE WALTER FEWKES has been appointed Chief of the Bureau of American Ethnology in Mr. Hodge's place, whose resignation is noted below.

MR. FREDERICK WEBB HODGE, who has been the head of the Bureau of American Ethnology of the Smithsonian Institution since 1905, has resigned to accept a position in connection with the Museum of the American Indian, Heye Foundation, of New York City. Mr. Hodge's resignation took effect on February 28.

MR. ROBERT CUSHMAN MURPHY of the Brooklyn Institute Museum read a paper before the New York Academy of Sciences on February 11 on "The Sea Birds of the Southern Hemisphere: Some Systematic and Distributional Problems."

DR. FRIDTJOF NANSEN, whose presence in this country as Minister Plenipotentiary of Norway on a Special Mission to the United States was noticed in the November, 1917, *Review* (p. 404), read a paper before the Washington Academy of Sciences on January 31 entitled "Changes in Oceanic and Atmospheric Temperatures and Their Relation to Changes in the Sun's Activity."

DR. C. S. SCOFIELD of the U. S. Department of Agriculture read a paper before the Botanical Society of Washington on December 4, 1917, on "Geographical Aspects of Haitian Agriculture."

PROFESSOR WALTER S. TOWER of the Department of Geography of the University of Chicago has recently been commissioned in the Meteorological Section of the Signal Corps of the Army and been ordered into active service.

PROFESSOR R. D. SALISBURY, head of the Department of Geography of the University of Chicago, was presented with the Helen Culver gold medal of the Geographic Society of Chicago on January 26.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

CANADA

General

- **Canada, Sea-fisheries of eastern.** 212 pp.; maps, diagrs., index. *Proc. Committee on Fisheries, Game, and Fur-Bearing Animals of the Commission of Conservation, June 4-5, 1912.* Ottawa, 1912.

The papers were prepared by recognized authorities in their respective fields, so that the volume contains a good deal of material of interest and value both from the industrial and the scientific standpoint. One of the most important papers bears the same general title as the volume, and was prepared by J. J. Cowie, of the Department of Marine and Fisheries. Other leading papers are "Whitefish of the Great Lakes," by M. J. Patton; "Conservation of the Oyster" and "The Oyster Fisheries of Prince Edward Island," respectively by Joseph Stafford and J. A. Mathieson; "Needs of the Fisheries of Nova Scotia," by Dr. Howard Murray; "The Shad Fishery of Canada," by E. E. Prince, Commissioner of Fisheries; and "Fish Culture in Canada," by W. A. Found, Superintendent of Fisheries.

At present the Fisheries of Eastern Canada fall into two distinct classes: the deep-sea and the coastal fisheries. The latter are by far the most important in that eight-ninths of the men employed in fishing prosecute the in-shore fishery. Here the main fish caught are cod, hake, haddock, pollock, halibut, herring, mackerel, shad, alewives, smelts, flounders, sword-fish, sardines, salmon, and shell-fish such as lobsters, oysters, and clams. The off-shore fisheries prosecuted on the numerous shallow regions known as "banks" yield cod, haddock, hake, and halibut. Between 1870 and 1885, the fisheries of the eastern provinces experienced a steady growth, but during the succeeding twenty-five years there was little or no growth. The most prolific waters are those of the Gulf of St. Lawrence. The shores of this region are climatically advantageous for drying the catch, being relatively free from fogs. The shores of the Bay of Fundy and southern Nova Scotia, however, have frequent fogs, so that artificial means of drying are resorted to. This process brings results in about two days as compared with a period of three weeks when drying is done by the older natural process through the agency of sun and air. In money value the herring fishery is relatively small; but, since herring is a fundamental bait, it is, in some respects, the most crucial catch of all, for upon the abundance or scarcity of herring taken depends, in a large measure, the success or failure of the great hook-and-line fisheries. The most valuable commercial fishery of eastern Canada is the cod, whose annual output is worth about \$4,000,000 out of a total of approximately \$16,000,000 for all kinds of fish.

AVARD L. BISHOP

- MILLER, J. O., edit. **The new era in Canada: Essays dealing with the upbuilding of the Canadian commonwealth.** 421 pp.; ill. J. M. Dent & Sons, Ltd., London, Paris, Toronto, and E. P. Dutton & Co., New York, 1917. 8 x 5.

A book which should be read by every geographer, not so much for professional enlightenment as for clearer vision respecting Canadian ideals and the place which our neighbor to the north is coming to occupy among the nations. To suggest opportunities for national and civic service is the chief purpose of the volume. There are sixteen essays portraying the upbuilding of the Canadian commonwealth. The opening and closing papers are both from the ready pen of Stephen Leacock and deal, respectively, with "Democracy and Social Progress" and "Our National Organization for the War." The latter was prepared originally for the use of the Canadian government and was printed in an edition of a quarter of a million copies; it has received most favorable comment especially in England. Sir Clifford Sifton, chairman of the national conservation commission, has contributed an able paper on "The Foundations of the New Era." That a new era will follow the declaration of peace is confidently affirmed. "The signs," says Sir Clifford, "are already evident. Province after province has sought to abolish the liquor evil, that fruitful mother of moral and physical degeneration. While

ur sons have been fighting in Europe the moral leaven has been working at home. Conventions of earnest-minded citizens have been held to consider schemes of social improvement. Men who scoffed a few years ago are the foremost now to demand reform. Many of them have given their sons to die a violent death in battle for a noble ideal, and they will not readily permit themselves to be influenced by any except the highest motives. Assuredly these strivings will be followed by momentous results."

The great wealth of Canada's natural resources is pictured by Professor Frank D. Adams of McGill University, while Sir John Willison writes ably of immigration and settlement. The bi-lingual question is skilfully presented by Professor Wrong of the University of Toronto. Other writers of equal prominence in their respective fields discuss such topics as national ideals in industry, Canadian national unity, Canada's future place in the Empire, equal suffrage and the work of women, financial problems, and the outlook for religious faith. On the whole the volume is of high grade. High motives prompted its preparation: the Canadian Red Cross Society will receive such profits as accrue from sales.

AVARD L. BISHOP

VICTOR, E. A., edit. **Canada's future: What she offers after the war: A symposium of official opinion.** xv and 320 pp.; ills., index. The Macmillan Co., New York and Toronto, 1916. \$1.50. 9½ x 6.

The book contains fifty-two concise papers by authoritative Canadian writers dealing with the present conditions in Canada and all leading phases of the industrial, economic, educational, and other achievements of the Dominion; also with the probable trend of future development as indicated by experience and progress in the past.

A book so produced may suggest that it is largely a symposium of praise; but this book is of another sort. It was written, for the most part, by specialists, men of science in the universities, directors of large industrial interests in the provinces, and other representative men who have come into wide recognition at home because their work of many years has helped to make Canada what it is at the present time. They tell of mistakes of the past and what has been learned from them; of achievements in agriculture, stock raising, and large industrial interests in spite of climatic and other limitations; and deal largely with the problems of the future. The index is by no means so comprehensive as consultants would like to have it.

CYRUS C. ADAMS

GRIFFIN, WATSON. **Canada: The country of the twentieth century.** 283 pp.; maps, ills., index. Dept. of Trade and Commerce, Ottawa, 1915. 10 x 6½. [A review of Canada's resources, industry, and commerce prepared primarily for the business man.]

LAWLER, JAMES. **Aperçu historique sur l'exploitation des forêts au Canada.** *Bull. Soc. de Géogr. de Québec*, Vol. 10, 1916, No. 5, pp. 271-281.

MACOUN, J. M., AND M. O. MALTE. **The flora of Canada.** 14 pp.; ill. *Geol. Survey of Canada Museum Bull. No. 26: Biol. Ser. No. 6.* Ottawa, 1917. [Reprint from Canada Year Book, 1915, pp. 43-55, Census and Statistics Office, Ottawa.]

MILLAR, W. N. **The big game of the Canadian Rockies: A practical method for its preservation. (Conservation of Fish, Birds, and Game.)** Ills. *Proc. Committee on Fisheries, Game, and Fur-Bearing Animals of the Commission on Conservation*, Nov. 1 and 2, 1915, pp. 100-124. Toronto, 1916.

— **Peace River District in the Provinces of Alberta and British Columbia, Description of surveyed townships in the.** 3rd edit. 262 pp.; maps, ills. *Topogr. Surveys Branch Bull. No. 35.* Dept. of the Interior, Canada, 1916.

THORSTEINSON, ELINA. **The Doukhobors in Canada.** *Mississippi Valley Hist. Rev.*, Vol. 4, 1917, No. 1, pp. 3-48. [An historical account of a peculiar Russian sect which has become established in western Canada.]

WHITE, JAMES. **Place-names in the Rocky Mountains between the 49th parallel and the Athabaska River.** *Trans. Royal Soc. of Canada*, Vol. 10, 1917, Ser. 3, pp. 501-535. [The list of names is preceded by a brief statement of the explorations chiefly responsible for their origin.]

WHITING, LILIAN. **Canada the spellbinder.** x and 322 pp.; map, ills., index. E. P. Dutton & Co., New York, and J. M. Dent & Sons, Ltd., London and Toronto, 1917. 8 x 5½.

— **Canada, Map of the Dominion of.** 1:6,336,000. Dept. of the Interior, Ottawa, 1916. [The standard small-scale general map of the Dominion.]

— **Canada, Railway map of the Dominion of.** 1:2,217,600. In 8 sheets. Dept. of the Interior, Ottawa, 1914. [The standard large-scale map of the Dominion. No relief; railroad systems distinguished by color.]

UNITED STATES

General

SOUTHWORTH, G. V. D., AND S. E. KRAMER. **Great cities of the United States: Historical, descriptive, commercial, industrial.** ix and 309 pp.; maps, ill., index. Iroquois Publ. Co., Inc., Syracuse, New York, 1916. 70 cents. 7½ x 5.

In their preface the authors compare the history of a country with its geography; as one is largely the story of its great men so the other is largely the story of its great cities. The book deals with the ten largest cities of the United States together with San Francisco, New Orleans, and Washington. The aim has been to group the important facts of the geography of this country around these thirteen cities. This plan has been carried out very successfully, and the book may be recommended as a supplement to the ordinary school geography, which of course it by no means supersedes. An interesting historical sketch introduces the study of each city, the methods and causes of its development are made clear, and local details are added to complete the picture in the student's mind. The special difficulties which many cities have had to overcome, for example transportation in New York, water supply and drainage in Chicago and New Orleans, are described. The illustrations are numerous and well chosen. A map of each city is included and there are a number of special maps which should be useful to an active-minded teacher. Among these are maps illustrating "New York's Subway and Bridge Connections," "Chicago's Canals," and "Boston's Land and Water Connections." At the conclusion are a number of tables with figures taken from government reports. The style is the somewhat chatty sort now commonly found in school texts.

R. H. JONES

KEYES, CHARLES. **Man's completion of nature's supremest effort on the Great Plains.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 7, pp. 257-259. [Stimulated desiccation through utilization of streams for irrigation.]

KLINGBERG, E. W. **Glimpses of life in the Appalachian Highlands.** *South Atlantic Quart.*, Vol. 14, 1915, No. 4, pp. 371-378.

KRUEGER, L. B. **Shipbuilding in the United States, past and present.** *Journ. of Geogr.*, Vol. 15, 1916-17, No. 8, pp. 251-258.

LOUGHLIN, G. F. **Slate in 1916.** *Mineral Resources of the United States*, 1916, Part II:8, pp. 61-72. U. S. Geol. Survey, Washington, D. C., 1917. [The slate industry by states. Pennsylvania and Vermont led in production, the two producing 88 per cent of the total. Less slate was sold for roofing in 1916, but more for school purposes. A return to the use of school slates, possible because of the increasing cost of paper, would still further increase this item of sales.]

LUNDGREN, LEONARD. **Forests of the United States.** Map, ill. Reprint from *Engincering Mag.*, Vol. 1, 1915, No. 1, pp. 1-17.

LUTZ, F. E. **Faunal dispersal.** *Amer. Naturalist*, No. 594, Vol. 50, 1916, pp. 374-384. [A discussion of fundamental differences in theories of faunal dispersion with specific reference to the criteria brought forward by Charles C. Adams in his paper "Southeastern United States as a Center of Distribution of Flora and Fauna" (*Biol. Bull.* 7, 1902, p. 122).]

MARSHALL, R. B. **Triangulation and primary traverse, 1913-1915.** vi and 655 pp.; map, ill., index. *U. S. Geol. Survey Bull.* 644. Washington, D. C., 1916.

MARVIN, C. F. **Applied meteorology and the work of the Weather Bureau.** *Proc. Ohio Acad. Sci.*, Vol. 6, 1915, Part V, pp. 265-276.

MURPHY, L. S. **The red spruce: Its growth and management.** 100 pp.; map, diags., ill. *U. S. Dept. of Agric. Bull. No. 544* (contribution from The Forest Service). Washington, D. C., 1917.

— **National Park Service, Report of the Director of the, to the Secretary of the Interior for the fiscal year ended June 30, 1917.** viii and 258 pp.; maps, diags., ill. Dept. of the Interior, Washington, D. C., 1917.

NELLIS, J. C. **Production of lumber, lath, and shingles in 1915 and lumber in 1914.** 45 pp.; map, diags., ill. *U. S. Dept. of Agric. Bull. No. 506.* Washington, D. C., 1917.

NEWLANDS, F. G. **River regulation and flood control.** 4 pp. *Congressional Record*, 64th Congr., 1st Sess. Washington, D. C., 1916.

O'CONOR, J. F. X. **The Jesuit Indian missions in the United States, 1565 to 1916.** *Proc. Nineteenth Internatl. Congress of Americanists held at Washington, Dec. 27-31, 1915*, pp. 487-502. [Smithsonian Institution], Washington, D. C., 1917.

PRAEGER, OTTO. **Aërial mail routes proposed by the Post Office Department and in connection with the transcontinental aëro contest.** Ill. *Flying*, Vol. 6, 1917, No. 2, p. 143.

PUTNAM, G. E. **The land credit problem.** (Humanistic Studies, Vol. 2, No. 2.) *Bull. Univ. of Kansas*, Vol. 17, 1916, No. 18, pp. 1-107. Lawrence.

REDFIELD, W. C. **Our fish need a P. D. Armour.** Ills. *Nation's Business*, Vol. 5, 1917, No. 9, pp. 31-33. [Treats of America's unused supplies of sea-food.]

STONE, R. W. **Phosphate rock in 1916.** *Mineral Resources of the United States*, 1916, Part II:6, pp. 29-41. U. S. Geol. Survey, Washington, D. C., 1917. [Shows the distribution of the world's deposits of phosphate rock.]

WINCHESTER, D. E. **Oil shale in the United States.** Ills. *Econ. Geology*, Vol. 12, 1917, No. 6, pp. 505-518.

WOODWARD, K. W. **Tree growth and climate in the United States.** *Journ. of Forestry*, Vol. 15, 1917, No. 5, pp. 521-531. [From the limited data available a correlation is attempted between the factors of forest productivity—diameter, height, growth, density, yield—and climatic conditions. The discussion recognizes fifteen forest types of which it is concluded that the most valuable for forest-producing purposes are those of the Douglas fir, white pine, and southern bottom lands.]

CAMPBELL, M. R. **Map showing coal fields of the United States.** [1:2,400,000]. In 2 sheets. Accompanying "The Coal Fields of the United States," by R. Campbell, *U. S. Geol. Survey Professional Paper 100-A*. Washington, D. C., 1917. [An important large-scale map. Base used is the General Land Office map of the United States.]

— **United States: The battle fronts of Europe.** [Extent of areas held by Teutonic Allies September, 1917; shown as if on United States territory.] 1 in. to 250 mi. (1:15,840,000.) Stanford's Geographical Establishment, London, 1917.

— **United States of America, Military map of the, showing location of all forces in training.** [1:6,000,000]. Union Pacific R. R. Co., Chicago, 1917.

EUROPE

BRITISH ISLES

JOHNSTON, J. B. **The place-names of England and Wales.** vii and 532 pp.; bibliogr., indexes. John Murray, London, 1915. 15s. 9 x 6½.

This work, a dictionary of English and Welsh place-names, with the oldest known spellings and probable derivation of each, is by the author of "The Place-Names of Scotland" (2nd edit., 1903). It contains the names of all villages and towns in the Postal Guide, as also those of all mountains, rivers, and islands—in all some 6,000 names.

The author, curate of St. Andrews, Falkirk, has labored for twenty years on this compilation. He has had access to the libraries of Edinburgh and Glasgow for original sources—Old English charters and chronicles, the Domesday Book, and specially the recent issues of the Close and Patent Rolls, heretofore practically untouched. A short bibliography of modern works used is given on p. 528, especially those on the place-names of the various counties by Skeat, Duignan, Wyld and Hirst, M'Clure, Baddeley, and Mutschmann. The dictionary, however, is hampered by the omission of a tabulated bibliography of original sources, which one must seek in W. G. Searle's "Onomasticon Anglo-Saxonicum," 1897. Thus the work of Glidas of the sixth century, which speaks of 28 cities of the Britons, is not mentioned; while that of Nennius, "Historia Britorum," c. 810 A. D., purporting to be a list of these cities, is mentioned often by author but not by title. The author found little assistance in the English gazetteers (e. g. Cassell's, 6 vols.; Bradner's, 6 vols.), or in the two articles in the last (11th) edition of the Encyclopædia Britannica, "Place-Names of England," by A. Mawer, Vol. 9, pp. 417-418, of Wales, by H. M. Vaughan, Vol. 28, p. 260. He has used extensively the etymologies in the Oxford Dictionary. A few names are not properly located, which is a difficulty for scholars outside of Great Britain; e. g. the Cotswold Hills (216), Gateshead (272), Hartlepool (293), Hauxley-on-Coquet (295).

The work makes no pretensions to completeness, but is merely a beginning in a field in which no other conspectus has as yet appeared. The study of English place-names is still young; apart from notes to "Anecdota Oxoniensia," the first work of permanent value on this subject is the "Place-Names of Cambridgeshire," by W. W. Skeat, which appeared only in 1901. The case with Wales is still worse. The only book dealing with the whole subject is the unscientific "Place-Names of Wales" by T. Morgan (2nd edit., 1912). The Britannica article mentioned is characterized on p. 67 as the list of a

"tyro." The author is wrong in saying (p. 69) that in Wales "no Roman inscription have yet been found," as also in the statement (p. 70) that in the Antonine itinerar "we can identify only three known names of today, and there is doubt even among these." It is also misleading to say (p. 4) that this Antonine road book, which is the best account of Celtic names (containing 22 town- and 11 river-names), was only put into final shape in A. D. 380, since this compilation belongs to the beginning of the third century.

The Introduction contains nine short chapters (pp. 1-83) explanatory of the dictionary, which forms the bulk of the book (pp. 87-532). In the second chapter "Roman and Latin Names," the author points out (p. 5) what is not known even to all classical students that the name Chester, found alone or in combination, is not the certain sign of Roman origin or proof of the existence on the site of a former "castra." For none of these "caster" names go back as names to Roman days. Some, e. g. Alia Castra for Alcester, are spurious inventions; Chester itself as a name is late; few are earlier than the beginnings of the Old English chronicles; thus Gloucester is first found in a grant of 681 as Gleaweceastre and Worcester is nearly as early. Consequently, -caster, Old English ceaster, is a Saxon rather than a Roman appellation. Similarly few names embody the Latin "colonia," e. g. Lincoln, Colchester. Very possibly the latter, Old English Colenceaster, means merely "camp on the Colne," and this river-name is Celtic, so that Colchester is of Saxon and not of Roman make. Thus there are hardly any real Latin names in England.

In the chapter on "The Keltic Element"—the most difficult problem in English and Welsh names—the author unscientifically differentiates, on the basis of dolichocephalic skulls which prove the existence of a pre-Celtic race, between Celtic place-names (he lists over 400 on pp. 18-21) and pre-Celtic (he lists 20 as possible on p. 22). He believes these "pre-Aryan" names are confined chiefly or altogether to rivers—Biddle, Bollin, Croco, etc. There is no linguistic proof, however, that such names are not purely Celtic. His statement (p. 7) that the Aryan Celts came to England "not a great many centuries before Julius Caesar" needs revision in the light of recent investigations into the age of Indo-European speech groups in Europe. He is probably right in saying (pp. 7-9) that the 50 Ogam inscriptions found in Wales, western Devon, and Cornwall date from late in the Roman occupation and are the work of the early Goidels (Gael) who crossed over from southern Ireland to Pembroke, while of the earliest Goidels in England we know next to nothing. He suggests with good reason that the Brythons, who followed the Goidels into Britain, came from tribes of the Belgae, since a comparison of Neolithic skulls of England and Belgium shows marked similarities. Though pointing out that too much stress has been laid on the number of English Celt names (especially of rivers), he goes to the other extreme in stating (p. 8) that over a large area of England "there are next to no Keltic names at all." His derivation of Ox- in Oxford (p. 11) and that of the Isis (the Latin name of the Thames above Oxford), from the Celtic root *use*, "water" or "river" (variously spelt now as axe, exe, esk, usk), is interesting. However, his equation (p. 272) of Gateshead (on Tyne) with Gabrosentum, deriving the latter from Celtic *gabar*, "goat," is probably wrong. Gabrosentum was almost certainly on the western and not on the eastern coast of Britain, and Gateshead doubtless formed the end of an old Roman road, so that the name Gateshead is probably not Celtic at all but Saxon (from Old English *zeat*, "gate").

In the chapter on "The English Element" he shows that the town names (p. 31) of Britain are overwhelmingly English as well as those of rivers (p. 29). In "The Scandinavian Element" he states that at least 15 Norse names (p. 39) survive in Cheshire alone, and that, inasmuch as only 4 of them appear in Domesday, most of them came in after the Conquest long after the end of Danish rule in 1042. Practically no Norman names, apart from those beginning with "beau" and "bel" (p. 63), survive in England. But Norman personal names are found very frequently appended to Old English ones.

In "The Names of Wales, Monmouth, and Cornwall" he is right in saying that few Roman -caster names are left. He makes a real contribution in deriving Cardiff (pp. 67-68; 185) from the Celtic *caer* or *car*, "fort," and Didius, the Roman general who in 50 A. D. fought against the British tribe of the Silures of that region. Thus Cardiff is one of the earliest Roman stations in Britain. Another contribution is the derivation of Denbigh. Whereas the author of the Britannica article on Wales refers it to *din*, "fort," Mr. Johnston shows (pp. 67; 230) that the name is not Welsh but Danish and means "dwelling of the Dane." He also points out (pp. 79-80; 521) the same author's fallacy in saying that Wrexham was Wrightesham in the Anglo-Saxon chronicle, for Wrightesham is not the original name and is not mentioned in that chronicle. The name is not Welsh but Anglo-Saxon, and probably comes from Wrytsleof, the "dux" at Crediton in 1026, and simply means Wrytsleof's home. Every Welsh river-name as

all as mountain-name (except Snowdon, which is Old English, p. 449) is Celtic (or e-Celtic?); but strangely enough five out of the twelve Welsh counties are Old English, Welsh, Norman, or English in origin (p. 75).

The book, with all the shortcomings of a pioneer work in such an enormous and complicated field, deserves much praise. It not only arouses the widespread and legitimate curiosity of the general reader interested in the origin of English names, but it furnishes many sidelights on the complex history of Britain and explains many of the special idiosyncrasies of the various peoples which have inhabited it.

WALTER WOODBURN HYDE

FIRTH, J. B. **Highways and byways in Nottinghamshire.** xviii and 426 pp.; maps, ills., index. Macmillan & Co., Ltd., London, 1916. \$2.00. 8 x 5.

FORDHAM, MONTAGUE. **A short history of English rural life from the Anglo-Saxon invasion to the present time.** With a preface by Charles Bathurst. xvi and 83 pp.; diagr., index. George Allen & Unwin, Ltd., London, and Charles Scribner's Sons, New York, 1916. 1s. 9d. 8 x 5½.

FRANKLIN, THOMAS, AND E. R. SHEARMUR. **British Isles.** 40 pp.; maps. (Practical Geography Notebooks based upon the Atlas Geographies.) W. & A. K. Johnston, Ltd., London, [1916]. 4d. 10 x 7½.

GRAS, N. S. B. **The evolution of the English corn market from the twelfth to the eighteenth century.** xiii and 498 pp.; bibliogr., index. (Harvard Economic Studies, Vol. 13.) Harvard University Press, Cambridge, 1915. \$2.50. 9 x 6.

GRAY, H. L. **English field systems.** x and 568 pp.; maps, index. (Harvard Historical Studies, Vol. 22.) Harvard University Press, Cambridge, 1915. \$2.75. 9 x 6.

HARDING, CHAS. **The remarkable warmth of January, 1916.** *Nature*, No. 2417, Vol. 96, 1916, Feb. 24, pp. 703-704. [In England.]

INGRAM, A. E. **Bradford.** 16 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19g. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [In spite of difficulties and anxieties the Yorkshire woolen mills have "experienced a prosperity never equaled since the memorable times of 1870-71." The American textile trade has also had a share of this prosperity: its purchases of colonial wools "have more than trebled those of the preceding year and are far in excess of anything ever known before, more than double even those of 1897, that year of large imports of free wool in full view of a coming tariff.]

JACKSON, C. E. **The place-names of Durham.** 115 pp.; bibliogr. George Allen & Unwin, Ltd., London, 1916. 2s. 6d. 9 x 6.

JEFFREYS, HAROLD. **On the vegetation of four Durham coal-measure fells: General description of the area and its vegetation.** Maps, ills. *Journ. of Ecology*, Vol. 4, 1916, No. 3-4, pp. 174-195.

KEITH, A. **The ethnology of Scotland.** *Nature*, No. 2501, Vol. 100, 1917, Oct. 4, pp. 85-88. [Review of recent contributions to this subject.]

AUSTRALASIA AND OCEANIA

MELANESIA, MICRONESIA, POLYNESIA

MACCAUGHEY, VAUGHAN. **The economic woods of Hawaii.** *Forestry Quart.*, Vol. 14, 1916, No. 4, pp. 696-716.

The Hawaiian archipelago, because of its remoteness from continental areas, is remarkable for the highly endemic character of its fauna and flora. It consists of over twenty islands and extends from the great volcanic island of Hawaii in the south-east to tiny Ocean Island in the northwest, a distance of 2,000 miles. The eight large islands, which are the only ones inhabited, have a combined area of 6,454 square miles, and of this more than half belongs to Hawaii. The other islands are small and barren and do not total more than 20 square miles.

The larger islands were formerly heavily forested in their interior, mountainous districts, but within historic time there has been extensive deforestation, and two of the islands (Lanai and Kahoolawe) have been completely denuded by goats and cattle.

The lowland climate is mild and equable, ranging from 65° to 85° F., with an average of 75° for the year. The high mountains of Maui and Hawaii (8,000-13,825 feet) have snow and ice, and there is a drop of about four degrees in temperature for each thousand feet of ascent. The main axis of the islands opposes the heavily water-laden trade winds which blow almost continuously from the northeast, producing pronounced humid and arid regions. The forest reaches its finest development in the rainy zone, but there are

some tall species on the barren lava flows and other xerophytic regions. In some regions the annual precipitation is from 400 to 500 inches, and the value of the forests in protecting the watersheds far exceeds their importance for timber.

The ohia lehua (*Metrosideros polymorpha*) is the most abundant tree, forms the largest pure stands, and varies from a stunted creeper in the swamps to a rather slender timber tree over a hundred feet in height in the great jungle forests. The koa (*Acacia koa*) produces the most valuable wood. Much of the koa forest has been despoiled and the timber is becoming scarce. The kukui, or candle-nut tree (*Aleurites moluccana*) inhabits the moist and mesophytic regions and produces large, hard-shelled, oily nuts which yield an oil similar to the tung oil of China.

The mesquite, algaroba, or kiawe (*Prosopis juliflora*), which has transformed the sands of acres supposedly worthless into valuable pasture land, was introduced from Mexico in 1837. The flowers afford excellent bee pasturage, the pods and seeds are reduced to meal for stock food, and the wood is valuable for fuel.

The native sandalwoods of Hawaii are semi-parasitic in habit, and the young trees presumably obtain a portion of their sustenance from the roots of other trees such as the koa. This timber was extensively exploited between 1790 and 1820, and only small trees now remain. The koko (*Euphorbia lorifolia*) and a varietal form yield a latex which may prove of value as a source of rubber and chicle.

There is a considerable list of other trees locally valuable for special uses but of limited occurrence for exploitation. Two genera of palms are native, and others have been introduced. There are no conifers. The tree ferns are "among the crown glories of Hawaii's beautiful jungle forest."

SAMUEL J. RECORD

ANGENHEISTER, G. *Die luftelektrischen Beobachtungen am Samoa-Observatorium 1912-13*. Diagr. *Nachrichten von der Kön. Gesell. der Wiss. zu Göttingen Math.-physik. Klasse*, 1914, No. 2, pp. 191-206.

BRANDSTETTER, RENWARD. *An introduction to Indonesian linguistics*. Translated by C. O. Blagden. xi and 251 pp. (Asiatic Society Monographs, Vol. 15.) Royal Asiatic Society, London, 1916. 7s. 6d. 8½ x 5½.

CROSE, W. M. *American Samoa: A general report by the governor*. 40 pp. ill., bibliogr. Navy Dept., Washington, D. C., 1916. [Report prepared in 1912: statistics up to 1911 (inclusive).]

DAVIS, W. M. *The origin of certain Fiji atolls*. Diagr. Reprinted from *Proc. Natl. Acad. of Sci.*, Vol. 2, 1916, Aug., pp. 471-475.

FOYE, W. G. *The geology of the Fiji Islands*. Reprinted from *Proc. Natl. Acad. of Sci.*, Vol. 3, 1917, Apr., pp. 305-310.

FOYE, W. G. *The geology of the Lau Islands*. Maps. *Amer. Journ. of Sci.*, No. 257, Vol. 43, 1917, pp. 343-350. ["The Lau group consists of fifty or more islands lying east of the two main islands of Fiji. They are scattered over 300 miles of the ocean floor from the 17th to the 21st parallels of south latitude and between the 178th and 179th meridians of west longitude. The average island is, perhaps, 4 or 5 miles in diameter and 300 or 400 feet in height."]

"The Lau islands are believed to have been formed by volcanic activity about the middle of the Tertiary period. They were later maturely eroded, submerged, and overlain unconformably by 300 to 500 feet of coraliferous limestones. Still later they were elevated, eroded, and a second period of basaltic eruptivity spread its debris over the eroded complex. In recent times certain of the islands in which limestones are alone exposed have been eroded to submerged platforms by atmospheric solution and, aided by a recent subsidence, atolls have developed in their place."

For a general geographical account of the group by the same author, see the November, 1917, *Geogr. Rev.*]

FRATER, M. *The volcanic eruption of 1913 on Ambrym Island, New Hebrides*. Ills. *Geol. Mag.*, Decade 6, Vol. 4, 1917, pp. 496-503.

GREGORY, J. W. *The Ambrym eruptions of 1913-14*. Map, bibliogr. *Geol. Mag.*, Decade 6, Vol. 4, 1917, pp. 529-540. [New Hebrides: see above under "Frater, M."]

HASWELL, WILLIAM. *Remarks on a voyage in 1801 to the island of Guam*. With an introduction and annotations by L. W. Jenkins. Map, ill. *Essex Inst. Hist. Collections*, Vol. 53, 1917, No. 3, pp. 193-214. Salem, Mass.

— *Hawaii, Territory of, Report of the Board of Commissioners of Agriculture and Forestry for the biennial period ending December 31st, 1914*. viii and 244 pp.; ill. Honolulu, 1915.

JAGGAR, T. A., JR. *Lava flow from Mauna Loa, 1916*. Map, diagr., ill. *Amer. Journ. of Sci.*, No. 256, Vol. 43, 1917, pp. 255-288.

- JAGGAR, T. A., JR. Thermal gradient of Kilauea lava lake. *Diagr. Journ. Washington Acad. of Sci.*, Vol. 7, 1917, No. 13, pp. 397-405.
- JAGGAR, T. A., JR. Volcanologic investigations at Kilauea. Map, diagr., ills. *Amer. Journ. of Sci.*, No. 261, Vol. 44, 1917, pp. 161-220.
- JUDD, C. S. Æolian erosion in Hawaii. Ills. *Amer. Forestry*, No. 280, Vol. 23, 1917, pp. 239-240. [A brief discussion, with two good illustrations, of eolian erosion on the island of Kahoolawe. Overgrazing has started land erosion on what was always more or less barren island and one used for a time as a place of exile for criminals. Sheep and goats were placed upon the island and overran it by the thousands, upsetting the balance of nature. Exposed to the full force of the trade winds the remaining turf was destroyed and the loose soil exposed, and this poured off the lee of the island on windy days in clouds of light red dust. With a view to reclaiming the soil over 4,000 goats have been exterminated in the last eight years, and recently there has been a noticeable growth of native grass and weeds. The mesquite of the Southwest has been spread by a few work horses which had been allowed to graze on the island, and this promises soon to become an extensive forest for the production of wood and beans, as well as blossoms for bee pasturage.]
- MACCAUGHEY, VAUGHAN. A survey of the Hawaiian land flora. Map, ills. *Botanical Gazette*, Vol. 64, 1917, No. 2, pp. 89-114.
- MACCAUGHEY, VAUGHAN. The food plants of the ancient Hawaiians. *Scientific Monthly*, Vol. 4, 1917, No. 1, pp. 75-80.
- MACCAUGHEY, VAUGHAN. The physique of the ancient Hawaiians. *Scientific Monthly*, Vol. 5, 1917, No. 2, pp. 166-174.
- MACCAUGHEY, VAUGHAN. Vegetation of Hawaiian lava flows. Maps, diagrs., ills. *Botanical Gazette*, Vol. 64, 1917, No. 5, pp. 386-420.
- MALINOWSKI, B. The natives of Mailu: Preliminary results of the Robert Mond research work in British New Guinea. Ills. *Trans. and Proc. Royal Soc. of South Australia*, Vol. 39, 1915, pp. 494-706. Adelaide. [The Mailu inhabit a portion of the extreme southeast coast of Papua. Ethnically they are classed as "Western Papuan-Melanesians."]
- MJÖBERG, ERIC. To explore unknown New Guinea by air route. Map, ill. *Flying*, Vol. 6, 1917, No. 2, pp. 149 and 155. [Outline of a project discussed in the same author's article in the February, 1917, *Geogr. Review* (Vol. 3, pp. 89-106).]
- Papua: Annual report for the year 1914-15. 197 pp.; maps, ills. Commonwealth of Australia, Victoria, 1916.
- PREUSS, PAUL. Wirtschaftliche Werte in den deutschen Südseekolonien. *Der Tropenpflanzer*, Vol. 19, 1916, No. 9, pp. 493-514. [Conclusion of an article the previous installments of which are in numbers not received by the Society.]
- ROUTLEDGE, SCORESBY. Easter Island: Maps, ills. *Geogr. Journ.*, Vol. 49, 1917, No. 5, pp. 321-349 (discussion, pp. 341-349). [Abstracted in the September, 1917, *Review*, pp. 221-222.]
- Samoa, The climate of. *Symons's Meteorol. Mag.*, No. 609, Vol. 51, 1916, Oct., p. 129.
- STRONG, W. M. Notes on the North-Eastern Division of Papua (British New Guinea). *Geogr. Journ.*, Vol. 48, 1916, No. 5, pp. 407-411.
- WEGENER, KURT. Temperatur und Regen in Samoa 1909 und 1910 in gedrängter graphischer Darstellung. Diagrs. *Nachrichten von der Kön. Gesell. der Wiss. zu Göttingen, Math.-physik. Klasse*, 1914, No. 1, pp. 95-100.
- WESTERVELT, W. D. Hawaiian legends of volcanoes. With a foreword by T. A. Jaggar, Jr. xv and 210 pp.; map, ills., index. Ellis Press, Boston, and Constable & Co., London, 1916. \$1.50. 7½ x 5.
- WOOD, H. O. Notes on the 1916 eruption of Mauna Loa. Maps, ills. *Journ. of Geol.*, Vol. 25, 1917, No. 4, pp. 322-336; No. 5, pp. 467-488.
- WOODFORD, C. M. On some little-known Polynesian settlements in the neighbourhood of the Solomon Islands. Maps, ills. *Geogr. Journ.*, Vol. 48, 1916, No. 1, pp. 26-54.
- New Caledonia, Geological map of, to illustrate a paper by R. H. Compton. 1:1,250,000. From the *Geogr. Journ.*, Feb., 1917.
- [Topographic map of the Hawaiian Islands.] Hilo (Island and County of Hawaii), Hawaii, sheet. 1:62,500. Surveyed in 1912-14. U. S. Geological Survey, Washington, D. C., 1917.

POLAR REGIONS

ARCTIC

BARTLETT, R. A., AND R. T. HALE. *The last voyage of the Karluk, Flagship Vilhjalmur Stefansson's Canadian Arctic Expedition of 1913-16.* 329 p. maps, diagr., ill. Small, Maynard & Co., Boston, 1916. \$2.50. 9 x 6.

This is the story of twenty-nine members of Stefansson's Canadian Arctic Expedition who drifted westward on the flagship *Karluk*, in the fall of 1913, while their leader and an Eskimo were on shore to procure fresh meat for the party (*Bull. Amer. Geogr. Soc.* Vol. 46, 1914, pp. 520-523). Soundings off Point Barrow showed that the drift to the northwest had already carried the party into ocean depths. They found the continental shelf again off the coast of Asia, as was to be expected from the *Jeannette's* drift. The party were carried within twenty-five miles of the supposed position of Keenan Island but a telescopic lookout for hours from the masthead revealed no land. Both seal and bear were in plenty. The book is wholly given to large and small detail of the drift which had its tragical side. Thirteen men perished after the *Karluk* sank, including three who died on Wrangell Island. The only white man of large polar experience was Bartlett, and there is evidence in this book that his authority was not properly recognized. Two small parties left Shipwreck Camp, and no detail of their fate is known. No lives were lost in the party that Bartlett piloted to Wrangell Island till after he left it. The rescue expeditions that went to Wrangell Island examined all sides of Herald Island and were convinced that none of the men reached it. CYRUS C. ADAMS

BRUUN, DANIEL. *Erik den Røde og Nordbokolonierne i Grønland.* ii and 238 pp. diagrs., ill., bibliogr. Gyldendalske Boghandel (Nordisk Forlag), [Copenhagen] 1915. 8½ x 6.

By the recent sale of the Danish West Indies, Denmark acquires, as part of the purchase price, complete sovereignty over Greenland, the United States renouncing all possible rights of discovery. In this connection it is interesting to read Mr. Bruun's account of the early Norse occupation of Greenland. Eric the Red, the hero of his book, was the father of Leif the Lucky, whose discovery of America about the year 1000 is now well attested by scholars. Eric was born in the southern part of Norway, but his father being banished for manslaughter, Eric went with him to Iceland, where they settled in the only land left to them, the barren strip under the glacier on the northwestern point of the island. Thence it was not far to Greenland, and when Eric, in his turn, committed manslaughter and was banished from his new home, it seemed natural to him to steer his course for the western land. He rounded Cape Farewell and made his way through the heavy drift ice to a spot on the southwestern coast near what is now Julianehaab. There he built his home, the first white colonist of Greenland. He named the land thus in order to attract settlers, and presumably there were many unruly spirits in Iceland, for soon two large settlements had grown up in the new land, one around Eric's home, the other farther north on the west coast.

Soon, however, the knowledge of Greenland became lost to the parent country, and there is even a tale that the German Hansa merchants in Bergen, in 1484, killed forty sailors, the only people who still knew the way thither. Be that as it may, when the Englishman, John Davis, landed on the coast of Greenland, in 1585, he found no white men, but only Eskimos. Mr. Bruun has explored the ruins of old Norse occupation for the Government. He found eighteen groups of buildings, including churches, dwelling houses, stables, and servants' quarters. His scholarly account is illustrated with a number of interesting maps and pictures. The work is published by the aid of the Raben-Levetzau Foundation in Denmark.

HANNA ASTRUP LARSEN

FICHELE, ALFRED. *De Tromsøe à l'Énisséi par l'Océan Glacial.* *Bull. Soc. de Géogr. Commere. de Paris*, Vol. 39, 1917, No. 4-5-6, pp. 154-157. [A voyage (1916) successfully accomplished against serious difficulties. Compare note in *Geogr. Rev.*, Vol. 3, 1917, pp. 151-152.]

GREEN, FITZHUGH. *Arctic duty with the Crocker Land Expedition.* Map, ill. *U. S. Naval Inst. Proc.*, Vol. 43, 1917, pp. 1941-1976; pp. 2193-2224; pp. 2455-2494; pp. 2799-2832; Vol. 44, 1918, pp. 75-105. [Abstracted in this number under "Geographical Record."]

MACMILLAN, D. B. *In search of a new land.* Map, ill. *Harper's Mag.*, No. 785, Vol. 131, 1915, pp. 651-665; No. 786, pp. 921-930.

MERCANTON, PAUL. *État magnétique de basaltes groënlandais.* *Comptes Rendus Hebdomadaires des Séances de l'Acad. des Sci. [de Paris]*, Vol. 165, 1917, Nov. 5, pp. 632-634.

NANSEN, FRIDTJOF. *Spitsbergen waters: Oceanographic observations during the cruise of the "Veslemøy" to Spitsbergen in 1912.* Maps, diagrs., ill., bibliogr. *Norsk Havnsselskaps Skrifter: 1. Mat.-Naturv. Klasse*, 1915, Art. No. 2 (pp. 1-132). Jacob Dybwad, Christiania, 1916. [The expedition was undertaken primarily to obtain data on the salinity of the deep waters of the North Polar Basin. Measurements of currents formed another branch of investigation.]

SPEERSCHNEIDER, C. I. H. *The state of the ice in the Arctic seas: Summary, average, limits, etc.* Maps. Special Print *Nautical Meteorol. Ann.*, 1916, 16 pp.; 17, 25 pp. Danske Meteorol. Inst., Copenhagen, 1917. [A parallel account in Norwegian and English of the limits of ice in the Arctic seas between Labrador and Norway and northward to the limits of observation. The report is accompanied by instructive maps showing the average limit, the extreme minimum limit, and the extreme maximum limit of the ice, and the extreme limit of icebergs. There are notes on the navigation of the sea, the probable best routes, and the monthly character and distribution of the ice. The maps bring out with remarkable clearness the festoons of ice between the neighboring land masses; e. g. between Novaya Zemlya and Spitzbergen, between Spitzbergen and Greenland, and, in the winter season, between Iceland and Greenland.]

THALBITZER, WILLIAM. *Hos Östgrönlaenderne i Grönlands sydfjorde, naermest ap Farvel, sommeren 1914.* Ills. *Ymer*, Vol. 37, 1917, No. 1, pp. 1-35. [Of the Greenlanders near Cape Farewell.]

SOLEY, JOHN C. *Greenland. Blueprint copied from Meddelelser om Grönland*, Vol. 41, No. 1. *Danmark Expedition 1906-1908.* 1:6,000,000. U. S. Hydrographic Office, New Orleans Branch, 1916.

SOLEY, JOHN C. *North-east Greenland: Original Charts.* 1:2,000,000. From *Meddelelser om Grönland*, Vol. 46, No. 2. Blue print. U. S. Hydrographic Office, New Orleans Branch, 1916.

MATHEMATICAL GEOGRAPHY

CARTOGRAPHY

— *Portolan charts, Facsimiles of, belonging to the Hispanic Society of America.* With an introduction by E. L. Stevenson. 16 charts and 4 pp. of text. (Publ. Hispanic Soc. of America, No. 104.) New York, 1916. 25½ x 20.

This publication is epochal in the history of cartography and a credit to its author as well as to the Hispanic Society, which has done much in recent years to make available to scholars, in the best form, the muniments of the older geography. This society has brought together one of the finest collections of original portolan charts in existence and certainly the greatest in America. Sixteen charts, typical of the whole field were selected for reproduction. They are facsimiled by the exact gelatine process, twelve in monotones and four in colors in imitation of the originals. They are printed on heavy handmade paper; are accompanied by an introduction and cartographical data, written by the editor; and are enclosed in a buckram portfolio case.

Portolan charts were particularly designed for use by mariners engaged in coastwise navigation. They were to the known sea routes what the road maps were to the interior on land. As navigators explored new coasts and maritime discovery expanded from European ports to parts beyond the ken of men, the portolan charts grew commensurately in extent. Dr. Stevenson expresses their value as follows: "For the student of that early period, they possess a never-failing interest, and as geographical documents they have a value unsurpassed. They are the first modern sailors' charts, the first of modern charts scientifically constructed."

The earliest extant portolan chart was made in A. D. 1311, by Petrus Vesconte de Ancona. The earliest chart owned by the Hispanic Society, reproduced in this publication, is attributed to Giacomo Girolodi and belongs to the early fifteenth century. The second reproduction is a chart by Petrus Roselli, 1468; there are eleven of the sixteenth century, and three later than the year 1600, ending with one by Cavalinni, 1637. Mostly, these charts depict the Mediterranean and portions of the Atlantic coast on either side of the Straits of Gibraltar. They are on single skins of parchment or vellum. Sometimes they are found assembled in the form of a portolan atlas. For the period before the sixteenth century about one hundred of these charts are known; after that they become more numerous. In workmanship they have their origin chiefly in Italy and Catalonia. They were "drawn in plane projection, that is, all degrees of latitude and longitude were represented as having the same length."

Pictorially, these charts are interesting. A net-work of lines crosses them, usually in multiples of thirty-two lines, which radiate from eight to sixteen different points of the chart, but in a systematic order. In some of them these centers of intersection have

highly colored decorations with figures that are called wind or compass roses. Other charts are virtually specimens of the art of the illuminator, as, for example, that of Petrus Roselli, on which are castles, tents, animals, flags, etc.; or that of Jaume Oliver (1566), with a representation of the madonna and child, large wind roses, etc., in many colors. Dr. Stevenson shows that there was some system in the application of the pigments. His analysis of the whole subject of portolan charts is the best succinct account of the subject that the reviewer has ever seen.

VICTOR HUGO PALTSITS

STUART, E. R. **Topographical drawing.** ix and 128 pp.; maps, diagrs., index. McGraw Hill Book Co., Inc., New York, Hill Publ. Co., Ltd., London, 1917. \$2.00. 9½ x 6

The European War has awakened interest in map reading, and our own entrance therein has accelerated the study and practice of map making. While numerous books cover the field-surveying end of the subject, topographical drawing has usually been dismissed with a short chapter. Until the United States Geographic Board, in 1915 adopted standard conventional signs for the use of all map-making departments of the government, every topographer was a law unto himself.

Colonel Stuart has taken the next step and provided a text covering standards of practice which combine good execution with economy of draughting time. The first six chapters, comprising an introduction, map projection, instruments and drawing materials, plotting, special methods in free-hand drawing, and practice in topographical drawing are intended largely for reference. In the next five chapters are illustrated and explained the various conventional signs. Map drawing is then taken up in the final chapter and is illustrated by a large plate in four colors.

JAMES GORDON STEESE

BENNETT, T. L. **On the effect of map distortion on bearings and distances.** *Diagrs. Caine Sci. Journ.*, No. 99, Vol. 8, 1914, pp. 257-262.

O'FARRILL, RAMON. **Problemas en el mapa.** (De un libro en preparación). *Boletín del Ejército*, Vol. 1, 1916, No. 3, pp. 219-235. Havana.

ZINGER (CINGER), N. J. **Sur les espèces les plus avantageuses des projections coniques.** *Bull. Acad. Imp. des Sci. [de Pétrograd]*, Ser. 6, 1916, No. 17, pp. 1693-1704. [In Russian.]

CORRESPONDENCE

To the Editor of the "Geographical Review":

May I venture a mild protest against the review of "Principles of Aerography" (pp. 167-168, February issue), which appears more like an attack than a well-considered criticism?

Granted that a reviewer, if an instructor, has a right to express an opinion of the availability of a work for class purposes. No objection is made to the individual view which in this case is adverse; but it is fair to say that some good authorities have without solicitation expressed a view to the contrary. The present opinion is in a class by itself.

When, however, an instructor seriously puts forth the view that the use of modern scientific terms is confusing to a student, because older and inaccurate terms have been used heretofore, the statement must not go unchallenged. The reviewer objects to "aërography" and prefers "meteorology" and "meteorological." Now "aërography" is as logical as "geography" or "hydrography," and no mind of ordinary intelligence would be thrown into confusion by using it. There are good reasons, too, why "meteorology" should not be used in describing the structure of the atmosphere.

Again, the term kilobar, to which exception is taken by the reviewer, is in no way more difficult to comprehend than kilogram. In physics and chemistry a bar is a definite unit, the unit of pressure expressed in terms of force. It is the force which would give to one gram an acceleration of one centimeter per second per second. One thousand bars would naturally be a kilobar and a million bars a megabar. The hundredth part of a bar would be a centibar and the thousandth part, a millibar. The value of a millibar may be written .001 dyne/cm², or as 10⁻³ bar. We need such a value because in absolute manometers differences in pressure of this magnitude must be measured. Again, with modern condensation high-vacua pumps, we operate with pressures as low as 10⁻⁵ bar, near the low limit of pressure. An instructor who proposes that his classes call a kilobar by the ancient name of millibar could with equal firmness insist that his students call a kilogram a milligram. Of course it would not be long before his students took him to task.

I make no comment on the rest of the review, which seems to lack coherency; but it may be noted that in one place the reviewer has failed to note the word *effective* in connection with the temperature of space and there is no contradiction such as he supposes.

Very respectfully,

ALEXANDER MCADIE

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ALBANIA AND THE ALBANIANS*

By H. CHARLES WOODS

Although her people have obviously not been able to play any direct part in the war, the geographical and political importance of Albania is such that the history of and the conditions prevailing in that country are worthy of serious consideration today. Geographically this importance is due to the fact that Albania occupies a position which makes it the natural means of entry into and exit from a large part of the western half of the Balkan Peninsula. For this reason the northern part of the country, together with the ports of San Giovanni di Medua and Durazzo, are coveted by the Serbs, who desire, by securing possession of them, to obtain free access to the sea. Equally well, by its situation on the lower Adriatic, Albania practically commands the Straits of Otranto, and the government in control there would control the Adriatic to which they lead. It is this which makes Italy particularly interested in the future of Europe's latest principality and specially in that of its southern port, Valona, for that Power cannot afford to be menaced by the establishment there of a régime hostile to her natural development, her safety, and her very existence.

Closely bound up with these conditions are the facts that, for years, Austria has been working untiringly to bring about the augmentation of her influence in Albania and that Greece has been striving to denationalize the people domiciled across her frontier. The first country, actuated by the intense rivalry existing between her and Italy upon all questions connected with the Western Balkans and the Adriatic, has acted as the instrument of Germany, with the object of preparing the way for the realization of the Mittel Europa scheme. The Hellenic Government on the other hand, whilst nominally animated by religious motives, has really directed its policy toward nationalistic objects. The result is, therefore, that the Albanian question, which was nominally settled by the creation of an autonomous principality during the Balkan Wars, still remains one of the most important problems for solution at the end of the present conflagration. It is for

* A chapter from a forthcoming book entitled "The Cradle of the War: the Near East and Pan-Germanism."

this reason, and particularly because the Allies and the United States are pledged to the principle of "government with the consent of the governed" or of "nationality" that we are bound to consider how this principle applies to Albania, whose people are entitled to expect the same consideration as any other small nationality.

GEOGRAPHICAL EXTENT

Prior to the Balkan Wars and the loss of territory which was then suffered by Turkey, it was difficult accurately to describe what was meant by the geographical term "Albania." Whilst an official of the Turkish Government always refused to acknowledge the existence of a district known by the name, an Albanian, a Greek, a Bulgarian, or a Serbian would each define the boundaries of Albania in accordance with his own national aspirations. Lord Fitzmaurice (then Lord Edmond Fitzmaurice) in a despatch addressed to Earl Granville in the year 1880 described the district covered by the geographical expression Albania as that territory "which falls mainly within the two vilayets of Skutari and Yanina, but extends also in an easterly direction beyond the watershed of the mountains dividing the streams which fall into the Adriatic from those which fall into the Aegean Sea and includes portions of the vilayets of Monastir and of Kossovo."

The principality of Albania, if principality it can still be called, contains more or less the area which is thus indicated. Situated on the eastern side of the Adriatic and wedged in between Montenegro, Serbia, Greece, and the sea, this unhappy country is the child not of love but of hatred, for its creation was brought about by the rivalry which existed between the Great Powers, and particularly between Austria and Italy, rather than as a result of any feelings of friendship for the Albanians. Whilst the independence of the country was decided upon by the London Ambassadorial Conference in December, 1912, the frontiers have never been definitely fixed, or, more correctly speaking, they have never been observed by the neighboring countries, especially Greece. At the present time, therefore, it is impossible to say whether, in discussing Albania, we should include or exclude the large southern areas which are in dispute with Greece and parts of which have been in Italian hands since an earlier period of the war. If we include these in Albania and consider that country as it was established by the Great Powers, then it has an area of about 11,000 square miles and a population of approximately 800,000 souls. Measured from north to south it has a length of about 180 miles, and from west to east an approximate width, at its broadest part, of only 85 miles.

CHARACTER OF THE COUNTRY

The greater part of the country is mountainous. In the neighborhood of Skutari, in areas of central Albania, and in the south, there are, however,

fertile plains watered by various rivers which flow into the Adriatic. The people devote themselves almost entirely to agriculture, which is carried on with primitive implements, such as wooden plows. There are no home manufactures. Goat and sheep skins, which are exported, are dried by pegging them down upon the ground with wooden pegs. One of the most important exports from the country is the bitumen found at Selenitza near Valona. The mine is worked by a French syndicate, and the bitumen, which is of high quality, is transported to the port on pack animals across the hills for a distance of some twelve miles. Towns properly so called are few. Skutari, having a population of about 32,000 souls and constituting the capital of the north, is the only city which boasts

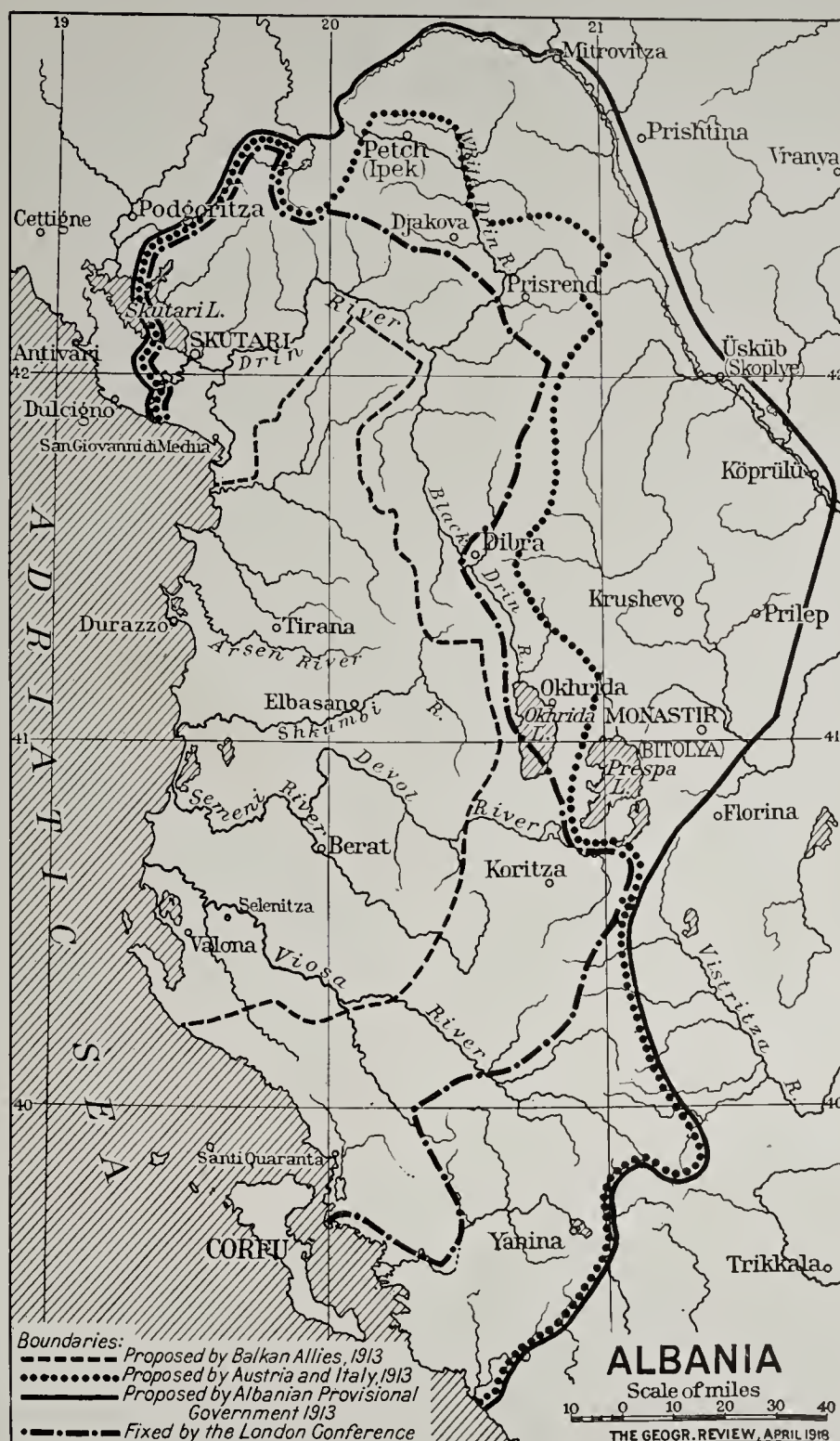


FIG. 1—Sketch map of Albania showing the various proposed boundaries and the boundary fixed by the London Conference of 1913. Scale, 1:2,900,000.

The boundaries are based on a map, 1:3,400,000, accompanying C. A. Dako: *The Independence of Albania a Necessity for International Peace*, 17*U'i Mengjezit* (*The Morning Star*), Vol. 1, No. 6, April 2, 1917, pp. 161-168 [an Albanian fortnightly published at Boston, Mass.]. For a somewhat different interpretation of the proposed boundaries, see the map (Pl. 33), 1:1,500,000, accompanying Antonio Baldacci: *Der neue albanische Staat und seine Grenzen*, *Petermanns Mitt.*, Vol. 59, 1913, Part 1, pp. 221-222.





FIG. 3.—Part of the town of Berat, showing the citadel.

more than 15,000 inhabitants. Durazzo, the so-called capital of the country and the former seat of the Prince's government, is built upon the site of the ancient Dyrrachion. It has a population of only 5,000. The city which is located on the northern shore of a commodious bay, where it is almost always safe for ships to lie, is practically surrounded by rocks and by the sea, except upon the side where the promontory upon which it is built is joined to the mainland. Valona, now occupied by the Italians, is possessed of a fine bay. Its population is about 6,000 souls. Elbasan, situated in the heart of the country and in the Shkumbi valley, is the proper capital of the country, not only on account of its central position but also because its inhabitants possess the most moderate political ideas and therefore voice what should be the general policy of a united Albania.

NATIONALITY

From a local as well as from a national point of view, one of the most important questions connected with Albania today is that which concerns the nationality of its inhabitants. In Turkish times these people, unlike the other alien races which went to make up the European provinces of the Ottoman Empire, were not formed into a "millet" or religious "community." In other words, whilst the nationality of the Bulgarians and the Greeks was recognized as the result of the existence of the Bulgarian and the Greek Churches, the Albanians, having no such bond, were classed in the census entirely according to their religion. Thus, if an Albanian belonged to the Orthodox Church he was called a Greek, if he was a Moslem he was put down as a Turk. This meant not only that the gallant Shkypetars, as the Albanians call themselves, were never supported by intrigues adroitly hatched in various capitals but also that their territory was a prey to the aspirations of their neighbors. This is a question of supreme importance, for whilst up to a point Abdul Hamid encouraged the Greeks, the Bulgarians, and the Serbians of Turkey in their nationalistic and religious ideas, with the express purpose of causing strife between these elements of the population, the Turks—old and new—never left a stone unturned to subdue the Albanians, whose sentiments of nationalism and of patriotism are probably older, stronger, and deeper than those of any other Balkan people.

The Albanians are generally and probably accurately identified by impartial authorities as the descendants of the ancient Illyrians, who were simply the inhabitants of Illyria and who in their turn were the offspring of the Pelasgians—the first people to come to Europe. It was to their forefathers, the Albanians allege, that St. Paul referred when he said "Round about unto Illyricum I have fully preached the gospel of Christ." But little is known about these Illyrians except that they were slow to accept the civilization of the Greeks and Romans and that subsequently they were driven westward towards the shores of the Adriatic by the ad-

ancing hordes of Slavs. From the time of the Turkish conquest, which may be said to have been completed about the year 1478, and soon after the death of the famous Albanian hero Skanderbeg, until the Balkan Wars Albania formed part of the Ottoman Empire and was nominally ruled from Constantinople. But such were the strength and the feelings of nationalism of the people that throughout this period they really enjoyed a considerable amount of independence, being governed largely by unwritten laws administered by the local chieftains. In short, for centuries the Albanians occupied in Europe towards the government a similar position to that held in Asia Minor by the Kurds. Both races are religiously unorthodox, both races have been utilized by the Turks to support them in times of need, and prior to the re-establishment of the Ottoman constitution in 1908, the attitudes of both races towards European interference in the Turkish Empire were made use of by the central government as a threat to the Great Powers as each new program for reform was suggested at Constantinople.

CHARACTER OF THE PEOPLE

The Albanians today are a warlike, lawless people, but nevertheless they have their own—and a very strict—code of honor and they are faithful even unto death. An Arnaut once engaged is not only a most trusty servant and loyal follower in the Near East, but he is the most useful protector of his employer in whatever difficulty may arise. Indeed, the honor of the people is such that if once they have entertained you in their houses, or if once they have given you a promise, you may be absolutely sure that nothing will be too great a sacrifice for them to make in order that that promise may be fulfilled. I well remember that on one occasion when I was traveling in Albania it was necessary to accomplish an extremely long journey in the course of one day. My guides and horsemen protested against my wish to do what they said was almost impossible. They finally agreed, however, and we started out on the morrow. These men walked hour after hour over the roughest of country, and we eventually accomplished my object, only because they went far beyond their bargain, even carrying me across rivers in the dark and protecting me against wild dogs in order that we might reach the house of friends before night. Compensation of course they got, but even compensation will not always ensure the honorable fulfillment of an agreement.

The Albanians are divided into two main groups, the Ghegs and the Tosks. The Shkumbi River, which enters the Adriatic halfway between the towns of Durazzo and Valona, and its picturesque valley, may be said to separate the country of the former from that of the latter. The Ghegs, or Northern Albanians, are, in their turn, made up of a number of warlike tribes, many of whom still live a feudal life. The Tosks, or Southern Albanians, are more civilized and perhaps less warlike than their northern

brothers. Their tribal system is much less well defined, but they owe their allegiance to local beys or chiefs, to whom they turn for guidance in all matters of importance.

RELIGION

Whilst foreign propaganda has done a good deal to excite the religious feelings of the people, the Albanians are not as a rule religious fanatics. At the present time about two-thirds of the Albanian population is Moslem. Of the remaining one-third the Christians of the north are Roman Catholics whilst those of the south belong to the Greek Orthodox Church. This religious division is due to several historical facts. Originally the people were all Christians, many of them having been converted as early as the first century. In earlier times the Albanians belonged to the Orthodox faith, but about the middle of the thirteenth century many of the Catholic Ghegs of the north abandoned the Eastern for the Western Church, and at the time of Skanderbeg there was a further secession. After the arrival of the Turks, when the people were Christian in little but name, large numbers embraced Islam, from secular rather than from spiritual reasons, that is to say, because the position of a Moslem was in many ways a more privileged one than that of a Christian. There was a further secession in the seventeenth century for like causes. But whilst there is often strife between the different religious elements, owing generally to misunderstandings, the people are in principle and at bottom Albanians before they are either Moslems or Christians. Consequently whatever disputes take place are rather results of political or local squabbles than of innate religious differences. There are districts where the inhabitants are entirely Christian and others where they are exclusively Moslem. But the greater part of the country is more or less mixed. In the south there is less religious strife than in the north. This is particularly true of recent years, for as the nationalistic movement has increased the Orthodox Albanians have grown to understand that their religion has been exploited by the Greek Church for political purposes. The power of that Church, therefore, is greatly decreasing, and the people are slowly coming to understand that they need not fear the attitude of their Moslem fellow countrymen.

LANGUAGE AND LITERATURE

The Albanians have their own language. It is held by most authorities to be of Aryan origin and probably formed the original speech of the people of large parts, if not the whole, of the Balkan Peninsula. Although the groundwork and grammar of the language are supposed to be Indo-European, a large number of words have been taken from the Turkish, Latin, Greek, Slav, and Italian tongues, which means that there are distinct dialects in different parts of the country. The people of the various regions have borrowed words from the language of the people nearest



FIG. 4.



FIG. 5.



FIG. 6.

FIG. 4 Durazzo, taken from back of the town.

FIG. 5—The author's caravan in central Albania; between Tirana and Kroya.

FIG. 6—The author's carriage in central Albania.



FIG. 7.—Panorama of the port of Valona on the southern Albanian coast. The town itself lies about a mile and a half from the sea, where the hills of the interior meet the marshy coastal plain.

them. Thus the ignorant Tosk of the south makes use of many more Greek words than a Gheg of the north, whom he would only understand with a certain difficulty. The fact, too, that Albanian was only reduced to writing in comparatively modern times, and that no general form of alphabet was decided upon until after the advent of the Turkish constitution, is largely responsible for the differences of the dialect which exist today.

There is nothing to indicate that prior to the seventeenth century the Albanians could read or write their own language, and the large majority of the people cannot read or write today. The earliest books in Albanian were published about three hundred years ago. These volumes consisted of religious works, dictionaries, and textbooks. Much later the Roman Catholic clergy furthered the language movement by providing the people with books, many of which were published in Skutari by the Jesuits, who began their work in Albania about the middle of the nineteenth century. But it is largely owing to the religious work undertaken by the British and Foreign Bible Society that the people have been provided with literature in Albanian. As early as 1824 the Gospel of St. Matthew was printed in Tosk Albanian at Corfu by the Ionian Bible Society—a society promoted and subsidized by the British and Foreign Bible Society. Three years later the whole of the New Testament was published under the same auspices in the same language. In this publication the modified Greek alphabet, used in the printing, was included in order to enable the illiterate people to read

contents. Between the years 1860 and 1870 a large portion of the Bible was translated by an Albanian, and a volume containing the four Gospels, the Book of Acts, and an alphabet, in Latin characters with certain minor alterations, was published for the Ghegs in 1866. This publication was followed by others printed in the Greek characters for the people of the south and in the Latin for those of the north and published in Constantinople between the years 1868 and 1879. Ten years later under the direction of Gerasim Kyrias, a patriotic Albanian who had studied in the American School at Samakov, the Book of Genesis and the Gospel of St. Matthew were printed in the new national alphabet (i. e. the Latin alphabet with modifications) adopted by an Albanian committee which met in 1879 to discuss the development of literature. So strong, however, was the Turkish opposition to the introduction of these characters that various publications subsequently made were not allowed to be printed in them. It was only, therefore, after the re-establishment of the constitution in 1908 that the question of the method of writing the language was again taken up seriously and that the new national characters were finally adopted. Their employment was as fervently opposed by the Young Turks as it had been by their predecessors.

POLITICAL CONDITIONS

Prior to the advent to power of the Young Turks every endeavor was made to hinder the nationalistic movement. At the same time, during the reign of Abdul Hamid the Albanians were treated with the utmost deference, and His Majesty did everything in his power to make certain of their support in time of need. The Albanian Imperial Guard, recruited from the south, was always well and regularly paid, and these soldiers were allowed to return to their villages as soon as their time had expired, instead of being retained with the colors for months or years beyond their proper period of service. During the days of the old régime, too, the Albanians, especially the tribes of the north, were permitted to manage their own internal affairs, practically without the interference of the Constantinople Government. It was only when the northeastern Ghegs—always actuated by feelings of antagonism towards their Slav brothers—seemed inclined to jeopardize the policy of their spiritual and temporal master at Constantinople, that troops were dispatched to Albania to quiet the country, either by bombarding the malefactors with shell or by bribing their leaders with decorations or with money.

After the re-establishment of the Ottoman constitution, the Young Turks, instead of recognizing that the Albanians could be of valuable support to them, immediately antagonized them by endeavoring to abrogate many of the privileges which they had previously enjoyed. In the north these endeavors took the form of striving to disarm the people, of attempting to do away with the tribal system of government by which the people had formerly been ruled, and of trying to introduce compulsory military ser-

vice. Throughout the country, too, and particularly in the south, another grievance common to the Moslem and Christian Albanians was the attitude of the Sublime Porte towards education. Not only did the Government fail to establish Albanian schools, but it actually opposed the opening and even insisted upon the closing of several schools established by the Albanians themselves. The result of this policy was that from the summer of 1909 right up to the time of the outbreak of the Balkan Wars, large areas of the country were in an almost continuous state of insurrection—a condition which was indirectly if not directly responsible for hastening the downfall of Turkey as a European Power.

AN AUTONOMOUS STATE

The Albanians took no active part in the Balkan Wars, because they hated both the Balkan Allies and the Turks with an equal hatred. On the one hand they knew that the Serbians, Montenegrins, Greeks, and to a lesser degree the Bulgarians all coveted areas of territory which were dear to them. On the other hand they recognized that an Ottoman victory would result in further attempts to denationalize and to subjugate them. The consequence was, that as the Turkish rule over Albania existed only in name, practically the whole country was overrun by Serbians, Montenegrins and Greeks, many of the farms and houses being burned and large portions of the population put to flight. The Balkan Wars were, however, an epoch-making period for the people because during the first campaign and at the end of November, 1912, Ismail Kemal Bey—a former member of the Ottoman Chamber and a leading Albanian—proclaimed an independent government at Valona and, some three weeks later, the London Ambassadors' Conference decided to establish an autonomous Albanian state. That decision, which was followed by prolonged negotiations between the Great Powers as to the status and the frontiers of the new principality, was finally carried out in a manner which made the adopted boundaries of the country a sort of compromise between those suggested by the Balkan Allies, who worked for a very small Albania, and those advocated by Austria and Italy, who, whilst claiming less than did the Albanian Provisional Government, none the less proposed a settlement too much in accordance with the basis of nationality to be acceptable to Serbia, to Montenegro, or to Greece (see map, Fig. 1). In short, whilst the Albanians finally got Skutari in the north and Koritza and Santi Quaranta in the south, they did not secure Ipek, Djakova, Prizrend, and Dibra—places which by their allotment to Montenegro and to Serbia robbed the people of northern Albania of market towns where they had always been wont to trade.

In addition to the fact that it did something to make known to Europe the claims of the Albanians, the Provisional Government of Ismail Kemal Bey, which in a way was the father of the state, together with others afterwards set up in districts not occupied by the Balkan armies or from which



FIG. 8.



FIG. 9.

FIG. 8—Santi Quaranta, a port on the southern Albanian coast opposite the northern end of Corfu.

FIG. 9—Skutari: the Turkish part of the town seen from the Tarabosh road. The Boyana River in the foreground.

they had withdrawn, maintained order and did wonders to preserve peace from the moment of their establishment until long after the arrival of the European Commission of Control (the appointment of which was decided upon by the Ambassadors Conference) in the early autumn of 1913. Indeed when I was in Albania immediately after this, although I found the international forces in possession of Skutari and three or four entirely independent governments in different parts of the country, such was the state of things that I traveled with perfect safety through the greater part of it without any guard other than a native policeman to enable me to find my way about.

WILLIAM OF WIED

Prince William of Wied, a major in the German Guards, who was nominated by the Great Powers in November, 1913, to rule Albania, arrived at Durazzo, which he constituted his capital, on March 7, 1914. The fact that his régime was a total failure is due in part to the international conditions then prevailing and in part to the rôle he personally played. On the international side trouble arose from the fact that Albania had been constituted largely in order to relieve European tension and some of the ever-recurring difficulties between the Great Powers. Moreover, whilst Europe had nominally fixed the northern and southern frontiers, she took no effective measures to hand over to the prince territory which was his. In the south, the Greeks remained in possession of large areas of Albania until the end of March, 1914. Most, if not all, of these districts were then officially evacuated. But, instead of the Greek regular army, there came the Epirot insurgents and the Epirote independent government, who, secretly supported from Athens, maintained a reign of terror in an area actually allotted to Albania. Thus throughout the stay of the "Mpret," as the Albanians called their ruler, the European concert, if concert it can be called, ignored the necessity for taking the measures essential for the protection of the country and looked on passively whilst the Greeks infringed the frontiers already delimited in the south and whilst the insurgents threatened and practically besieged Durazzo in a manner which finally confined the power of the prince almost to the very precincts of his palace.

Thus enormous difficulties must have beset any ruler of Albania. His Royal Highness, whose shortcomings were apparent from the first, made little endeavor to overcome them. To say nothing of his attitude towards the southern frontier question, concerning which he should have made some stipulation with the Great Powers before he ever entered upon his new task, the prince made at least two fundamental mistakes. By arriving at Durazzo, instead of entering his new country by way of Skutari, which was still in the hands of the international forces which occupied it in the first Balkan War, and which was therefore more or less neutral country, the new ruler seemed to show his partiality towards Essad Pasha and thus offended

the enemies of a man, who, if then powerful in the center of the country, was certainly not beloved beyond the confines of his own particular district. Subsequently, instead of trying to take the people into his confidence before it was too late, and of endeavoring to travel among them, the prince appeared to think that he could maintain his authority by encouraging one section of the community to support him against the other and that he could succeed in Albania without any display of courage. Thus on May 24, a few days after the banishment of Essad Pasha, at a time when Durazzo was threatened by the insurgents, the prince and his family took refuge on an Italian warship—an act which was enough to seal his fate in a country where cowardice is not one of the faults of the people. As time wore on things went from bad to worse until the outbreak of the war, immediately before which the international contingent vacated Skutari and immediately after which the prince and the International Commission of Control left Durazzo.

PRESENT CONDITIONS

Before the prince departed on September 11, Turkish insurgents, having occupied Valona, advanced upon Durazzo. From that time onwards, therefore, the country, once more left without even the vestige of a central government, was ruled by various self-constituted administrations, all practically inter-independent. At first Prince Burhan Eddin, son of the ex-Sultan Abdul Hamid, was the nominal chief of an administration which owed any force it possessed to the local power of Essad Pasha. After the subjugation of Serbia and Montenegro, in the winter of 1914-15, when a large number of Serbians retreated to the Adriatic coast through Albania, the northern and central districts of the country were overrun by the Austro-Germans, who finally occupied and still hold about three-quarters of the principality. Aside from the fact that a proclamation was issued by the enemy in 1917, to the effect that he proposes to create of Albania some kind of autonomous province, closely allied to if not constituting an integral part of Austria-Hungary, we therefore have no reliable information concerning the conditions prevailing in an area which is entirely cut off from communication with the Allied world.

SOUTHERN ALBANIA

In the south, where the Italians occupied Valona on December 25, 1914, before the entry of that country into the war, events have been bound up with the attitude of the Hellenic Government towards the Epirus question, with the relations existing between Greece and Italy upon that subject, and with the developments in the zone actually held by the forces of King Victor Emanuel. With regard to the first two questions sufficient be it to say that in December, 1916, shortly after the capture of Monastir by the Allies, Colonel Descoin, acting on behalf of the French Government, proclaimed the establishment of a small autonomous Albanian state, to include Koritza

and the area immediately surrounding that town. Farther to the south, where the Greeks had evacuated areas previously held by them, the Italians took over a large section of Epirus and occupied Yanina, actually in Greek territory, during the spring of 1917. After the abdication of King Constantine in June, 1917, and the return to office of M. Venizelos it was, however, arranged at the Paris Conference of the following month that the Italians should withdraw from all but the triangular area of Greek territory through which the road from Santi Quaranta to Koritza runs. This arrangement, together with the fact that M. Venizelos has always endeavored to adopt a moderate attitude upon the Southern Albanian frontier question, have, it must be hoped, created a new atmosphere—an atmosphere in which this highly complicated problem may be able to be solved at the same time in accordance with the principle of nationalities and without serious detriment to the interests of the two countries most closely affected by this ever-vexed question.

ITALIAN OCCUPATION

Whilst prior to her adhesion to the side of the Allies, Italy contented herself by the occupation of the port of Valona, later she extended her front so that it ran along the lower reaches of the Viosa River, which constitutes the natural defensive line for that city. Subsequently, too, she disembarked another force at Santi Quaranta, which, acting with the army already at Valona, advanced into the interior and ultimately established connection near the village of Cologna with the Allied forces based upon Saloniki. Since that time Italy has been in occupation of approximately a quarter of the whole country—a quarter in which she has done a great deal to improve conditions previously prevailing. Considerable lengths of road have been built by the Italians—lengths which have not only facilitated communication but also have provided the native population with work at a fair rate of pay. Agricultural colleges have been established, and the farmers, now able to obtain machinery, are being encouraged to cultivate their ground systematically. Numerous schools have been opened, and the children are thus educated in a manner which has never previously been possible. Last but not least the Italians, realizing that the way to win the people is to leave the direction of local affairs as far as possible in their own hands, have established courts of justice, some of which are presided over by natives brought over from the large Albanian colony in Italy, and have formed a local police corps under the supervision of Italian officers.

THE FUTURE

With regard to the future there are two questions of outstanding importance. The first is the problem bound up with the frontiers of the country—a problem complicated in the extreme. It would seem that the Albanians and their friends would do well to work not for the establish-

ment of new but for the rectification of present frontiers. If that policy be adopted, the principal directions in which attention should be turned are towards a change in the south which would bring the whole of the road from Santi Quaranta to Koritza within Albania, instead of leaving it to pass through a triangular area of Greece, as it did prior to the war; towards the inclusion in Albania of Dibra, Prizrend, and Djakova—towns which are absolutely essential as market centers, and towards the regaining of the tribes of Hoti and Gruda, which are so absolutely Albanian in sentiment that they will never peacefully accept any form of alien rule. With such modifications of the decisions arrived at by the London Ambassadorial Conference, Albania would not possess all that she desires but she would at least be constituted on a basis that would make her national existence practicable instead of impossible, as it was during the régime which immediately preceded the war.

Turning to the future status of the principality, on account of the aspirations of her neighbors, of the lack of development of the country, and of the inexperience of the vast majority of the people in all matters pertaining to government, I do not think that, for the present at least, Albania can exist or manage her affairs entirely alone. Consequently, as a return to the state of things existing after the Balkan Wars is impossible, only two alternatives appear to be left. The first is some form of autonomy under all or perhaps a group of the Allied Great Powers—an arrangement carrying with it the difficulties always arising from combined control. The second is her protection by some one of the countries now fighting for the interests of smaller nationalities. If this latter alternative be adopted, as neither the United States nor Great Britain would be likely to wish to undertake the task, it would naturally fall to Italy, who has already proclaimed "the unity and independence of all Albania under the aegis and protection of the Kingdom of Italy" and who has, as I have said, shown her good will towards the Albanians. Such a solution might not at once be acceptable to those of the inhabitants who actually desire to be entirely independent. But patriots as they are, these men will do well to remember that in addition to helping them establish good government and develop their country, the protection of Italy will provide them with a powerful friend—a friend without whom they might be helpless not only to enlarge, but even to maintain, their present frontiers.

AMERICAN EXPLORERS OF AFRICA

By EDWIN SWIFT BALCH

[With separate illustration, Pl. II, facing p. 280.]

Americans are different from Englishmen in regard to their great travelers. The British always make the most of their great travelers. They give them full credit for what they have accomplished, they keep on their charts all English names and all names given by English discoverers, and in so doing sometimes they eliminate the names given by earlier explorers of other nationalities. We Americans, on the contrary, do not stand up enough for our great travelers. For instance, no official protest has been made, as should have been done, in regard to the name of Wilkes Land. Americans are a patriotic people, their conduct in the present world war shows it, but, in regard to geographical discoveries outside of the United States made by Americans, they seem too inert and too indifferent to assert themselves and to back up their own sons.

Among the geographical discoveries by Americans which are too much neglected at home are those made in Africa. And yet in the closing period of the "age of discovery," in which the secrets of the so-called Dark Continent were revealed, three Americans, Paul Belloni Du Chaillu, Charles Chaillé-Long, and Arthur Donaldson Smith, and one Anglo-American, Henry M. Stanley, made certain the existence of a race of African pygmies, put upon the map the greater part of the course of the Congo, and cleared up a large part of the mystery of the source of the Nile. And as it happens that, from accidental circumstances, I was thrown into relation with all four of these distinguished men, some notes of a reminiscent character about the three who have passed away may be of value in the history of geographical discovery.

THE PYGMIES

That there were pygmy tribes in Africa was asserted by Herodotus, who, of course, is supposed to have drawn on his imagination for his facts. In the beginning of the seventeenth century A. D., Andrew Battel¹ speaks of a West African tribe called Matimbas, whom he does not claim to have seen, and who, he says, are no bigger than boys twelve years old but are very stout. In the nineteenth century several travelers reported seeing individual dwarfs from the far interior. For instance Dr. Krapf,² one of the discoverers of Kenia and Kilimanjaro, examined one slave who was only four feet high, besides hearing in Shoa of a tribe of dwarfs living to the south of Abyssinia.

¹ The Strange Adventures of Andrew Battell of Leigh, etc., in "Purchas his Pilgrimes," Glasgow, 1905-07, Vol. 6, p. 401.

² J. L. Krapf: Travels, Researches, and Missionary Labours, London, 1860, pp. 51-54.

It was the American, Paul Belloni Du Chaillu, however, who actually determined the existence of a race of pygmies and brought back an account of them from the depths of the gloomy Gabun forest where he, first of all white men, visited one of their settlements. He had been already largely discredited because he was the first to hunt and kill the gorilla.³ Huxley, for instance, criticized him severely and asserted that though Du Chaillu's statements might be true they were not evidence.⁴ How it is that in science true statements are not evidence Huxley does not explain. It is also well to remember that some of Huxley's own very positive opinions, as for instance those about the Neanderthal man,⁵ have not stood the test of time. But the discovery of the pygmies by Du Chaillu, coming so soon after his account of the gorilla, did not help to improve his reputation.

The American Chaillé-Long⁶ and the Italian Miami first brought back living pygmies from the Niam-Niam country. Later the Anglo-American Henry M. Stanley⁷ in the Congo forest, and still later the Philadelphian Arthur Donaldson Smith⁸ in eastern Africa, completed the discovery of the belt of pygmy tribes extending across equatorial Africa. It is, therefore, correct to assert that the existence of a race of African dwarfs was revealed to the world mainly by Americans.

DU CHAILLU

The venturesome journeys of Du Chaillu made substantial additions not only to zoölogy and to ethnology but also to geography proper. For on those journeys he broke much fresh ground in the unknown hinterland of West Africa, between the equator and the mouth of the Congo. The country formerly called the Gabun and now usually called the French Congo, with its pygmies, its cannibal Fan tribes, and its gorillas, was revealed to the world by Du Chaillu. He explored the Ogowe River and the Rio Fernand Vaz and on his last journey advanced into Ashango Land to Muau Kombo, about 1° 50' S. and 12° 40' E., where he found some creeks running eastward.⁹

Du Chaillu I knew only at the end of his life, long after he had ceased his adventurous hunting career. He was of French descent, short of stature, and plain in appearance. He was a very pleasant man, sociable and friendly. He was not in the least embittered, although he had every reason to be; for he told me that years after all his statements had been verified, many people still disbelieved in his discoveries and as a rule looked on him as a sort of Baron Munchausen.

³ P. B. Du Chaillu: *Explorations and Adventures in Equatorial Africa*, London, 1861.

⁴ T. H. Huxley: *Evidence As to Man's Place in Nature*, London, 1863, pp. 53, 54.

⁵ Arthur Keith: *The Antiquity of Man*, London, 1915, pp. 130, 131.

⁶ Charles Chaillé-Long: *My Life in Four Continents*, 2 vols., London, 1912, pp. 126-131.

⁷ H. M. Stanley: *In Darkest Africa*, 2 vols., New York, 1890, *passim*.

⁸ A. Donaldson Smith: *Through Unknown African Countries*, London and New York, 1897, pp. 272-277.

⁹ P. B. Du Chaillu: *A Journey to Ashango-Land*, New York, 1867.

SOURCES OF THE NILE

It was that weird character, Richard F. Burton, who first successfully led an expedition from the east into Africa in search of the reported lakes.¹⁰ Lady Burton states that Burton applied for Captain Speke as a companion.¹¹ Burton certainly deserves more credit than he usually receives for his discovery of Lake Tanganyika was the start in clearing up the mysteries of the sources of the Nile and the Congo. On the return journey while Burton was lying ill at Kazeh, or Tabora, Speke made a flying trip northward and reached the southern extremity of a great lake which he believed was the source of the Nile.¹² Burton naturally said that Speke was a humbug. Speke, however, started afterwards on another journey with Colonel J. A. Grant,¹³ passed all around the western edge of this lake which he called Victoria Nyanza, reached a point north of it where a great river was flowing north, and crossed this river again at a point farther west. This river he asserted was the White Nile. On his return he drew, almost entirely from hearsay, a map of the Nile sources¹⁴ which is so nearly correct that it must be looked on, together with Wilkes's chart of the Antarctic Continent,¹⁵ as among the most marvelous achievements of cartography.

Sir Samuel White Baker next added largely to the knowledge of the Nile sources. He discovered Albert Nyanza and coasted along its eastern shore until he reached the mouth of the inflowing Nile, whose exit from Victoria Nyanza had been visited by Speke. But Baker made one remarkable error. As he stood on the heights above Vacovia, at the extreme southeastern end of Albert Nyanza, he persuaded himself that he was looking over a sheet of water stretching south into indefinite distance, and he thus laid down the lake on his map. In fact, while Speke seemed to guess geographical features intuitively right, Baker seemed to guess them intuitively wrong.¹⁶

CHAILLÉ-LONG

Charles Chaillé-Long comes next in time as one of the discoverers of the sources of the Nile. He reached Victoria Nyanza from the north and was the first white man to paddle on its waters. On his return he explored the great river which drains Victoria Nyanza and which is the main upper branch of the White Nile. While paddling down it in canoes, amid hostile tribes and almost superhuman difficulties, he discovered a third unreported great Nilotic lake which, on his return, the Khedive Ismail named Lake Ibrahim.¹⁷

¹⁰ R. F. Burton: *The Lake Regions of Central Africa*, 2 vols., London, 1860.

¹¹ Isabel Burton: *The Life of Captain Sir Richard F. Burton*, New York, 1893, p. 257.

¹² J. H. Speke: *What Led to the Discovery of the Source of the Nile*, Edinburgh and London, 1864.

¹³ J. A. Grant: *A Walk Across Africa*, Edinburgh and London, 1864.

¹⁴ J. H. Speke: *Journal of the Discovery of the Source of the Nile*, Edinburgh and London, 1863.

¹⁵ Charles Wilkes: *Narrative of the United States Exploring Expedition*, Philadelphia, 1845.

¹⁶ S. W. Baker: *The Albert Nyanza, Great Basin of the Nile*, London, 1866; *idem*: *Ismailia*, New York, 1875.

¹⁷ Charles Chaillé-Long: *Central Africa: Naked Truths of Naked People*, London, 1876.

In Africa, Chaillé-Long afterwards led an expedition from Lado on the Nile into the Niam-Niam country, where he received the dwarf Ticki-Ticki as a present and where he beheld the Niam-Niams feasting after a battle upon their slain enemies. Chaillé-Long also commanded an expedition which for awhile occupied the land near the mouth of the Juba River. Some years after this, he was the first white man to visit the large island of Quelpaert, off the coast of Korea, and he also stumbled across the statue of Marco Polo in the "Great Flowery Temple of Five-Hundred Genii" in Canton.¹⁸

Chaillé-Long was of French descent. He was most lovable, courteous, and charming, a true gentleman of the old school, and as brave a man as ever lived. I met him only during his later years, when I had a great deal of correspondence with him. In one of his letters he wrote most feelingly about Mr. George C. Hurlbut, the former editor of the *Bulletin of the American Geographical Society*, who had just been killed in an automobile accident. He had the highest opinion of Hurlbut, an opinion with which I am in thorough accord, because, with a sense of humor which flashed out now and then in his articles, Hurlbut was a searcher for the truth and was not afraid

to espouse an unpopular cause when he thought it a worthy one. Chaillé-Long also thought most highly of Chinese Gordon as a man and as a soldier. But he did not look on him in the least as a saint. In fact the real Gordon was probably a very different character from what he has been represented to be by some of his admirers.

Chaillé-Long deserves a high place among world explorers. As yet he has not received the credit due him, and this is partly because he was an American. His labors cleared up a large part of the Nile mystery and entitle him to rank as one of the four discoverers of the sources of that river. His explorations were made while he was in the service of the Egyptian Government, and it was on this account that, when he discovered a third and a totally unsuspected great Nile lake, the Khedive Ismail named it Lake Ibrahim, after his soldier father, Ibrahim Pasha.¹⁹ But when the British declared a protectorate over Egypt, they were not especially desirous that the Egyptian control of Uganda and other provinces of the White Nile region should be remembered, and possibly for that reason, although they were careful to retain the names Victoria, Albert, and Albert Edward for the other three great Nilotic lakes, they changed the name of Lake Ibrahim to Lake Kioga. It was only by a personal appeal to that great



FIG. 1—Charles Chaillé-Long, 1842-1917.
(Courtesy of Mrs. Chaillé-Long.)

¹⁸ Chaillé-Long, *op. cit.* in footnote 6, *passim*.

¹⁹ *Ibid.*, p. 103.

man, King Edward VII, that Chaillé-Long was able to have the name Ibrahim placed on British official maps together with the name Kioga.²⁰

STANLEY

Henry M. Stanley followed Chaillé-Long and completes the quartet of discoverers of the sources of the White Nile. On his second journey he



FIG. 2—Henry M. Stanley in the United States Navy uniform he wore at the capture of Fort Fisher, January 15, 1865.

circumnavigated Victoria Nyanza which he proved to have been laid down by Speke with almost absolute correctness. Thence he followed known trails to Nyangwe, 4° 15' S. This was the farthest point reached on the Congo by that noble Scotchman David Livingstone, who explored the headwaters of the Congo yet curiously enough never realized that he was on the Congo but died believing that he was among the headwaters of the Nile.²¹ From Nyangwe, Stanley pushed down the Congo in canoes and amidst fearful dangers followed the course of the great African river to the Atlantic Ocean.²² On his last journey Stanley explored the whole of the tributary of the Congo, the Aruwimi River. He then discovered Albert Edward Nyanza, Ruwenzori, or the Mountains of the Moon, and the Semliki River which drains this vast extent of mountainous country and is the

second great headwater of the White Nile.²³

It was my good fortune, on one occasion, at the very outset of his career to see a great deal of Henry M. Stanley. I was still a boy, and we were then living in Paris at 48 Avenue Gabriel, on the Champs Elysées. My father made a trip to Egypt at the time of the opening of the Suez Canal and met Stanley at Cairo in February, 1869. In his diary my father records that Stanley had been "sent to Aden en route to Zanzibar to meet Dr. Livingstone, but at Aden met a British ship returning with news that there was no chance of Livingstone coming back that way. Pursuant to

²⁰ Chaillé-Long, *op. cit.* in footnote 6, pp. 543-569.

²¹ Horace Waller: *The Last Journals of David Livingstone*, New York, 1875, pp. 322, 416, 476. etc.

²² H. M. Stanley: *Through the Dark Continent*, 2 vols., New York, 1878.

²³ Stanley, *op. cit.* in footnote 7.

orders he came to Cairo to organize an expedition to meet Livingstone on the Nile, but here met Dr. Kirk's [letter] and now returns to New York via Paris."

My father gave Stanley a letter of introduction to us, and when he came to see us and found I could speak French like a Parisian and was tremendously interested in African exploration he asked me to act as his guide and

To my dear Young friend
 Edwin
 from
 Henry Morton Stanley
 Feb 27th 1869

FIG. 3—Autograph in the copy of Livingstone's "Missionary Travels" presented to the author by Stanley.

interpreter during his stay in Paris. I used to walk down every morning to the Hôtel du Louvre, where he was staying, and go with him everywhere—to the Louvre, to Versailles, to Vincennes, to Saint Cloud, and other places. I remember how especially he was interested in "Le Stryge" at Notre Dame. The bill for our excursions was paid by the *New York Herald*.

Stanley was a Welshman by birth, but he was brought up in America, and, at least at the time when I was thrown in contact with him, his characteristics were purely American. He was in no respect English in his ways. A rather short, extremely stocky man, he suggested immense physical strength and was distinctly a man of action rather than a man of thought.

THE SEARCH FOR LIVINGSTONE

Stanley and I became fast friends during the time we were together, and I was so enthusiastic about African exploration that, when he started in the fall of 1869 on his circuitous journey which led him across Persia and finally to Africa in search of Livingstone, he wrote and asked me to accom-

pany him. This invitation my parents declined to let me accept, fortunately for me or I should not now be writing this article. On his departure from Paris, as he thought he should have no further use for them, he gave me the copy of Livingstone's "Missionary Travels"²⁴ and the copy of Young's "Search after Livingstone"²⁵ that he had purchased when he started for Zanzibar to interview Livingstone on his expected arrival at the coast. On the back of the map in Young's book he had jotted down at Aden the following questions to put to Livingstone (reproduced in facsimile on Pl. II).

1. How came Moosa to be separated from you?
2. Where did the Johanna men leave you?
3. Did Wakotani leave you as is said?
4. How far up the Rovuma did you go.
5. What point did you touch the Lake Nyassa. 6. What date.
7. How many days did you tarry at the Lake.
8. Did you suffer any inconvenience from the Ma-zitus.
9. Were you kindly treated by the Chipeta people.
10. Also the Babrisa people.
11. Did you have a dog named Chitani with you.
 What date did you land at Zanzibar?
 How many days to Nyassa.
 Did Marenga treat you well.
 Did you stop at Corma.
 You avoided the Ma-zitus in toto.
 Did Moosa separate from you at Marenga. Page 178.
 Did you go to the northern or the southern end of Lake Nyassa.
 Was the Havildar killed at Mapunda, or was Moosa robbed and ill treated. 198.
 Did Chitani's tail turn to the left as Buffon remarks that peculiarity of dogs.
 Are the Makololos and Ma-zitus dwarfs(?)
 Have you been sick.
 Did you kill a chief of the Ma-zitus. 231.
 How long did you stop with the Ma-Takas. See Appendix.
 How long were you in the vicinity of Lake Pamalombe.
 Lake Tanganyika you were at in October last year, in Ujiji.

The present generation, of course, has forgotten the avidity with which news about the sources of the Nile was received half a century ago. To anyone, however, who remembers the excitement caused by Livingstone's reported murder, the questions will recall one of the most thrilling incidents in African exploration. But the autograph has one especial interest: it is absolutely the first thing that Stanley ever did in connection with Livingstone. It is true Stanley had been to Magdala with Napier's military expedition against King Theodoros,²⁶ but he had no idea of becoming an African explorer when he was first sent to meet Livingstone, in fact he told me that, if he was lucky, he was in hopes of some day exploring Central

²⁴ David Livingstone: A Popular Account of Missionary Travels and Researches in South Africa, London, 1861.

²⁵ E. D. Young: The Search after Livingstone, London, 1868.

²⁶ H. M. Stanley: Coomassie and Magdala, London, 1874.

1. What cause Messa to be left
 a. ated from you?
 2. Where did the Bohama men
 leave you?
 3. Did Makotani leave you
 as said?
 How far up the Rovuma did
 you go?
 At what point did you take the
 Lake Nyasa? What date?
 How many days did you stay
 at the lake?
 Did you suffer any illness
 from the Ma-jitos?
 Where you kindly treated by the
 Chipela people?
 How the Babine people?
 Did you have a dog named
 Chitani with you?
 What date did you land at
 Zambiar?
 How many days did you stay
 at Maseru? How did you
 treat you well?
 Did you stop at Chroma?
 You avoided the Ma-jitos in toto,
 did you separate from you
 at Maseru? Page 178.
 Did you go to the northward
 of the Eastward of Lake Nyasa?
 Was the Hani Ed, or Kileo at
 Maseru? or was Maseru
 to the S. of the lake?
 Did Chitani's tail turn to
 the left as Baggin remarks
 that peculiarly of dogs?
 Are the Makolobos & Magilus men
 Have you been with

Did you kill a chief of the
 Magilus 231.
 How long did you stop with the
 Ma-Jahai. See appendix
 How long were you in the vicinity
 of Lake Panalombe?
 Lake Mnyamika you were at in
 October last year in Ujiji.

Asia. These questions therefore were merely jottings for an interview which never took place, but they were the very start of all the work Stanley afterwards did in Africa, in finding Livingstone, in exploring the Nile and the Congo, and in connection with the founding of the Congo Free State.

Stanley told me many things about his early career, some of which are not published in his biography.²⁷ One of them was his making a voyage as a sailor before the mast to Spain when he was about sixteen years of age. When the crew was not allowed to land at some Spanish port, Stanley quietly jumped overboard and swam ashore. During the Civil War, he said, he acted for a while as reporter for a Northern newspaper. One morning, about five o'clock, he was lying in his tent with another reporter on the outskirts of the camp, when he was aroused by an unusual noise. He looked out and saw a Confederate regiment, which had surprised the pickets, advancing with fixed bayonets in full charge. Stanley bolted and escaped, while his companion was captured. He wrote a few lines in the copy of Livingstone's "Travels" he presented to me, and these I reproduce in facsimile (Fig. 3) because at the time I knew Stanley he called himself "Henry Morelake Stanley," a name he seems later to have changed to "Henry Morton Stanley."

The brilliant record of American enterprise in the exploration of Africa should certainly receive more attention than it does from our historical geographers. They should follow the excellent example of our British cousins of celebrating the fame of their great explorers and should see to it that the names of Du Chaillu, Chaillé-Long, Stanley, and Donaldson Smith are kept alive in our schools and our histories as those of men who have deserved well of America.

²⁷ Dorothy Stanley, edit.: *The Autobiography of Sir Henry Morton Stanley*, Boston and New York, 1909.

THE DEVELOPMENT OF THE PHILIPPINE ISLANDS*

By H. J. WATERS

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The Philippine Islands are very far from a satisfactory state of development. The Bureau of Lands estimates that less than one-half of the agricultural lands of the islands are in cultivation. The Philippine Islands have a population of only 8,750,000 and yet import more foodstuffs per capita than does Japan with a population of more than 50,000,000. If the Filipino sugar planters harvested as much sugar to the acre as do the planters of Java, the Philippines, without increasing the area in cane, would be the leading cane sugar producing country of the world, Cuba alone excepted. If the rice growers of the Philippines obtained as high acre yields as do the rice growers of Japan or the United States, instead of buying from India and Japan one-fourth the rice consumed in the islands, the Philippines would be the third largest rice-exporting country in the world. If the acre yield of corn in the Philippines equaled that of the United States or Japan, the Philippine Islands would have grain enough to support a larger pork and poultry industry than has either Canada or Australia.

These are among the possibilities of the Philippines, with less than half the reasonably good agricultural land in cultivation. When all the land is utilized to the limit of its producing power, when the fisheries, manufactures, and commerce of the islands are developed, enough food and wealth will be produced to support 40,000,000 people, a population as large as that of Great Britain. Two types of farming are necessary to the proper development of the Philippines; the small family farm for most of the land and people, and the large, capitalized plantation for the production of sugar. The Government of the islands has not yet fully recognized the difference in the requirements of the type of agriculture which involves large areas, much capital, and ample powers, and that which is best organized as household farms. Immigration to furnish the labor for developing quickly the resources of the islands would have to come from China, Japan, and India, and the capital would have to come largely from the United States.

THE BUSINESS OF THE PHILIPPINES

Before the war disturbed world business, the value of the purchases of the people of the Philippines amounted to about \$2,500,000 more than the

* The author visited the Philippine Islands in the summer of 1914 on request of the insular government to investigate the agricultural conditions and possibilities of the islands. In this article are embodied the main features of geographical interest of his report (The Development of the Philippines: A Summary of the Results of Special Investigation Made by Henry Jackson Waters, President of the Kansas State Agricultural College, by Authority of an Act of the Legislature of the Philippine Islands, 45 pp., Bureau of Printing, Manila, 1915).

value of their sales. A study of the business of the islands reveals many wastes. For example, approximately 9,000,000 pounds of raw sugar are annually sold from the islands at an average price of two cents a pound, all of which, or its equivalent, is brought back again as refined sugar at five cents a pound. What was sold for \$180,000 was bought back for \$450,000. It cost approximately \$70,000 to refine this sugar. The balance of \$200,000 was absorbed in transportation charges and profits to people who, for the most part, do not live in the islands.

One may ride for days through grass up to the saddle skirts without seeing a herd of cattle, carabao, or horses. Meanwhile, the people of the Philippines are paying the farmers of Australia and India about \$1,750,000 annually for meat and work stock.

With large forest resources, the Philippines buy more than \$500,000 worth of lumber a year outside of the islands. Yearly purchases are made outside the islands aggregating \$12,500,000, on which the people of the Philippines pay an import duty of some \$2,500,000, all of which the islands are capable of producing without beginning to tax the resources of the soil or the people.

The articles sold from the islands are principally raw materials, which support manufacturing industries and give employment to labor in other countries. But by exporting, for example, coconut oil instead of the dried cake a home industry might be developed, a substantial profit would be saved, and the coconut cake would be left at home as an excellent and very much needed food for live stock. The Filipino farmer suffers from limited credit, high interest rates, and the natural and irremediable handicap of floods, droughts, and typhoons. He suffers also from the remediable handicaps of defective land titles and a small family income. He sells the products of his labor at an inopportune season and at a low price and buys his supplies in small quantities at a high price. The Government is remedying the defects in land titles, but progress along this line is slow. The Government has a well-organized and well-managed Central Agricultural Bank, which is very helpful. The family income may best be increased by increasing the area tilled and by creating profitable home industries.

STRESSING IMPORTANT INDUSTRIES

Agriculturally the Philippines must be essentially a rice, corn, sugar, copra, hemp, tobacco, carabao, cattle, poultry, pig, and pony producing country. Development along these lines is safe and sure, and there is abundant room for improvement in each. Special crops, such as citrous fruits, coffee, cacao, rubber, kapok, silk, and tea may be produced in a few special localities.

A larger and better laying hen, such as has been developed in South China and recently introduced into the Philippines, would be able to turn the balance of trade of the islands from the wrong to the right side of the

ledger. Crossing the Philippine pony with Australian or Arabian stock has produced an animal much better adapted to the needs of the islands than is the present stock. It has been shown by experiment that Galloway and Indian cattle cross well on the native stock, and their offspring make a very satisfactory beef animal. The average yield of rice in the Philippines with unimproved seed is less than twelve bushels an acre. As much as fifty bushels to the acre has been produced by the use of pedigreed seed.

THE LIVE-STOCK INDUSTRY

No one versed in animal husbandry would think of the Philippine Islands as an important live-stock country when compared with such countries as the United States and Argentina. Yet, when compared with other tropical countries or when compared with a semitropical country like Japan, in the number of animals at least, the Philippines make a good showing. For example, there are in the Philippines about seven times as many hogs, four times as many goats, and thirty times as many sheep as there are in Japan. In the number of horses, the Philippines fall far short of Japan, there being only about one-seventh as many, and only about one-sixth as many cattle. The carabao in the Philippines, however, easily offset the difference in the number of horses in the two countries.

The Filipino farmer has not yet learned the very important lesson that the Japanese farmer has only recently learned—the same lesson which the farmers in the United States were a long time in learning—that real progress can come only through better breeding and better care of the animals. Universally the owner of scrub stock gives them scrub care, while the immediate effect of placing improved stock in the hands of the farmer is to increase his interest in them and to increase the intelligence with which they are fed and managed. Much of the present opposition to the enforcement of quarantine regulations in the Philippines will subside when the farmer has improved stock.

There is a large area in Mindanao, the southernmost island of the archipelago, and many smaller areas elsewhere in the Philippines well adapted to the raising of cattle, carabaos, and ponies that are not being utilized. I am certain from personal observation that no public land approximating in value as a cattle range that of Bukidnon Province has been open to the settler in the United States within the last quarter of a century. I was told by those who have had experience with cattle on this range that two and a half acres of land will support a bullock the year through. Pasture land in the United States that will support a bullock half of the year for every two and a half acres has a market value of \$25 to \$45 an acre, and a rental value of \$1.50 to \$2.00 an acre a year. In the Philippines grazing land may be leased from the Government on long-time contracts for a few cents an acre.



FIG. 1.



FIG. 2.

FIG. 1—On the way to the vegetable market—an example of the Filipino's waste of time. This family left home in the middle of the afternoon and arrived at the market about ten o'clock the next day, having driven all night. By the time they returned home they had consumed two days and two nights and had marketed 82 cents worth of farm products.

FIG. 2—A Filipino pig market. Pigs in the baskets. The man in the center had carried his two pigs twenty-two miles to market. (All figures, except Fig. 3, from photographs by the author.)

THE SUGAR WASTE

The glaring defect in the sugar industry in the Philippine Islands is the method of extracting the sugar from the cane, 25 per cent of the sugar being lost in the process of milling. The Bureau of Agriculture of the Philippines has introduced and developed a number of strains of cane that promise to be more productive than those commonly grown, but the stalks are so large that they cannot be successfully milled with the present facilities. Other means of increasing the cane tonnage, such as deeper and more

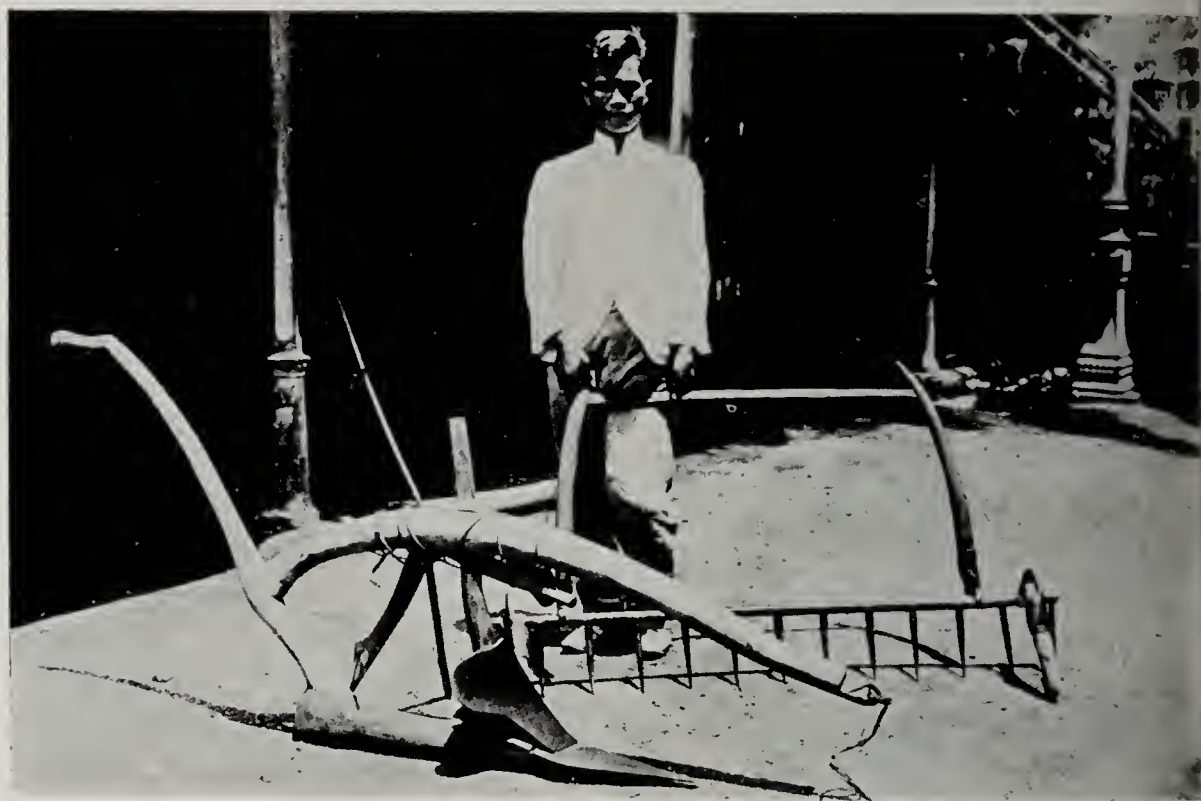


FIG. 3—A native plow and harrow, the complete equipment of machinery for the average Filipino farm.

thorough plowing, crop rotation, the use of fertilizers, and, in some localities, irrigation, are available, but these means are of secondary importance.

Various suggestions have been made for meeting the need of capital among the planters. People competent to speak on this matter assert that outside capital would be available for the erection of all the mills needed in the islands if the Government would declare sugar centrals a public utility and would confer upon their owners the right of eminent domain with respect to the location of the mill, the right of way of its railroad tracks and switches, its pipe lines, sewers, and wharves, and if the Government would also regulate competition by the same control it exercises over other public utilities, such as railroads, telephones, and banks, with respect to the rates charged, the nature of the contract between the mill owners and the planters, the location and plans for the mill, railways, pipe lines, sewers, and wharves, and make the central subject to governmental control with respect to the efficiency of its management.

FEEDING THE PEOPLE

The first duty of the agriculture of a country is to provide a suitable and ample food supply for its people. No race has found rice to be a satisfactory principal diet upon which to rear children or to support labor. Unfortunately, the substitution of corn in whole or in part for rice, which in many sections of the islands could be accomplished with comparative ease, will not remedy the difficulty, because the deficiencies of corn are greater than are those of rice.

Some gain can be made by encouraging people to eat unpolished instead of polished rice. But the desire to eat polished rice, like the desire to eat white bread, reaches very deep into the prejudices of the human race. White bread and polished rice are everywhere the marks of respectability. Black bread and unpolished rice have at all times been the food of the poor. Besides, unpolished rice will furnish only a small part of the additional nutrients needed. Beef, pork, and poultry products will always be so dear that they will be beyond the reach of any except the well-to-do. For the masses, fish, beans, and peas must be relied upon to supply the deficiencies of rice and white bread. Even in the United States, where more meat is produced than in any other country in the world, we are beginning to look to the development of our fisheries and to the production of peas and beans as a means of supplementing wheat and corn as human food.

Germany up to the outbreak of the war was doing much to stimulate the production and use of fish as food. Bounties were paid, tonnage exemptions granted, and low rates of transportation allowed, to encourage the production and shipment of fresh fish. Educational campaigns were conducted by the Government, to show the people how best to cook and serve different kinds of fish, with a view to increasing the consumption of this kind of food. In traveling through Germany, one was constantly impressed with the degree to which the people use beans and peas as a substitute for meat. The ruggedness and efficiency of the German people cannot be questioned.

The Japanese have been obliged to meet the same problem. Along with rice they consume large quantities of barley, beans, and peas, as well as much fish and poultry. With the exception of barley, all these products may be made available in the Philippines. There is no reason why the poultry industry may not be highly developed. Unfortunately, no legume has yet been found that is to the Philippines quite what the soy bean is to Japan, what the white navy bean and the cowpea are to the United States, or what the lupines and lentils are to Germany.

INCREASING THE FISH SUPPLY

Fish is already an important part of the diet of all classes of Filipinos. It is not certain whether the Philippines have as extensive fishery resources as some other countries, for they have not been developed. As the climate

is hot and cold-storage facilities are not generally available, it is essential that the fishing industry be so developed that it will be subject to as little interruption as possible by storms. This may be accomplished by stockpiling the fresh waters of the islands and by encouraging fish farming. Japan is an example of the possibility of this sort of farming. In that country in 1903 there were 7,657,000 acres of fresh water devoted to the cultivation of carp, eel, snapping turtle, and the like, producing a yearly income of \$683,250. In ten years the annual returns were increased more than threefold, while the area devoted to fish farming had been enlarged only a third.

Deep-sea and shoal fishing should be encouraged. To carry on successful deep-sea fishing, it is necessary to know the exact location and extent of the fishing banks. The determination of the location of the fishing banks is a governmental function.

RELIEVING POPULATION PRESSURE

Population is not evenly distributed, and development is by no means uniform. In some regions, as in Cebú and Siquijor, there is considerable crowding, while in others, as in Mindanao, vast stretches of fertile land are yet unoccupied. In Cebú and Siquijor apparently all the land is in cultivation that is capable of yielding a satisfactory harvest. Indeed, I saw many fields of corn or other crops that are too steep and stony to be tilled profitably, or to support the right sort of family life. The farmers try to grow two and frequently three crops of corn on the same land each year, yet the yield of all three crops is pitifully small for one crop. The land was originally fertile, but much of it is so sloping that it has become very badly eroded. The supply of vegetable matter in the soil is practically exhausted and the soil is left without power to withstand the severe droughts that are common at some seasons of the year.

At first thought, the remedy would seem to be to induce a part of the people now in the overpopulated regions to move to the unoccupied lands. This, however, I learned, is not easy to accomplish with the home-loving Filipino, besides, such a remedy would be only temporary. No country has been helped permanently, much less saved, through the emigration of its best stock. The people who emigrate to a new country are the strongest and best, the weakest being left behind to become the parents of the next generation. Some plan, therefore, must be evolved under which the people may support themselves well where they are.

It is true that if the farm crops were wisely rotated, the fields better tilled, improved seeds planted, and fertilizers applied, the harvest would probably be sufficient to support comfortably all the people now living in these regions, but it is idle to think of a farmer rotating his corn with clover or cowpeas so as to increase the subsequent yield, when the land is needed all the time to grow corn with which to support his family. It is equally futile to advise the use of fertilizers when capital is not available. In

Improvement in farming will come slowly, scarcely more rapidly than the increased food, which the improvement brings, will be needed by the natural increase in population and by higher standards of living.

Moreover, there is a very definite limit to the degree to which a country can be developed by means of agriculture alone. When this limit is reached, as it seems to have been in these cases, further progress will come only from putting the people to work in other directions. Germany long ago reached the limit of her growth under agriculture alone, and developed manufactures. Japan's recent remarkable development has been through industry rather than agriculture. The United States, until recently the largest food-exporting nation in the world, is beginning to look to other countries for a part of her food and henceforth must rely more upon her manufacturing industries. The Filipinos would be following the teachings of the best experience of other peoples by setting to work to develop manufactures. During my visit to some of the overcrowded islands, I saw ships bringing away hogs, corn, and other food products which

were needed as food for the people at home. Every effort should be made to change the exports of these islands from food products to manufactured articles. At first, and perhaps permanently, the manufacturing must be done in the household. Schools in the congested centers can be converted into practical trade schools. There will then be money available with which to support the family, while legumes are grown on the land for green manure and with which to buy fertilizers and other equipment. The combined income of an improved agriculture and a well-organized household industry would set the people well on their way toward a condition of prosperity and commercial independence.

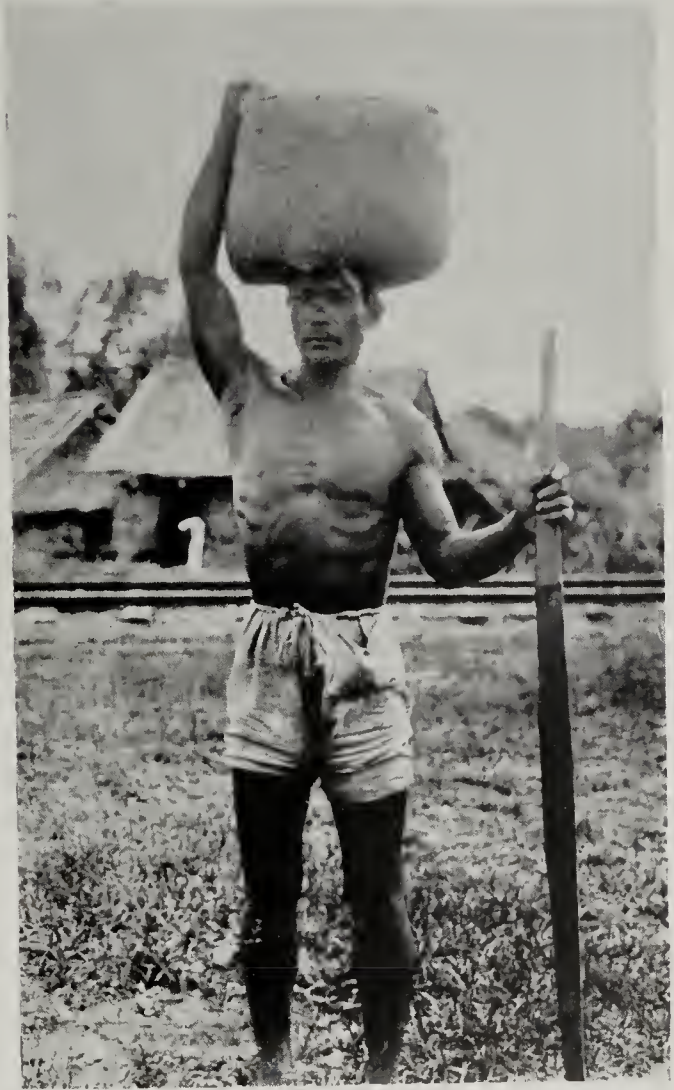


FIG. 4—A native Filipino farmer on the way to market with his corn.

SETTING THE PEOPLE TO WORK

Setting the people at the tasks that they can best perform is the high duty of the schools. There is at present a stupendous waste of labor and time. I saw bands of able-bodied men and women passing through rice fields reaping the grain with an instrument less efficient than a jack-knife. In other fields I saw farmers cutting rice with a hand sickle such as was used in Biblical days. Even the use of this ancient method economized the time of the harvesters tenfold over that most generally employed. It would seem to be easy to persuade farmers to make a change that would so reduce the cost of harvesting. Yet the necessity for economizing labor or time does not appeal strongly to those who have little else to do. With any people the change to more economical methods is made easier if more profitable tasks are at the same time provided.

HOUSEHOLD INDUSTRIES

Filipino women are skillful, industrious, and eager to learn, and a good beginning in household arts has already been made. At the outbreak of the war nearly \$500,000 worth of hats and some \$200,000 worth of embroidery were exported from the Philippines. Philippine-manufactured articles are admitted into the United States duty free, while the articles manufactured in other countries with which the Filipinos would compete are taxed by the United States.

Hats are now one of the most important household products. Only three kinds are exported. Many of the remaining twenty varieties produced in the provinces are also capable of commercial development, yet a large number of American-made hats are worn. All the hats worn in the island should be produced there, and the export hat trade might be greatly increased.

Embroidery is an infant industry. Exporters say that the supply has not met more than a fraction of the demand. The industry is now confined to a few towns near Manila and is capable of being greatly extended.

The Philippines produce a great variety of textiles on foot looms, but entirely for domestic consumption. If the efforts of weavers are turned to the production of artistic articles and cloth suitable for use in the United States, the industry can be made much more remunerative than it now is. To this end the Bureau of Education is introducing labor-saving mechanical devices.

Baskets are a relatively new product, having been developed for export entirely in the schools. The great quantity of materials available, together with the efforts of the schools, should result in a larger basket industry even than Japan's.

The work of the schools in standardizing the handicraft products and in creating new household industries is certain to produce immediate results.

a satisfactory system of selling is worked out. To find or create a market for such industries is a proper function of government.

THE SCHOOLS AS THE FOUNDATION OF THE FUTURE

Most of the progress in all directions, and particularly in agriculture and industry, will be dependent upon the school system and general education. In fact, even now one cannot help being impressed with the practical nature



FIG. 5—Formerly the castle of a Moro chief, now an American school house.

of the instruction offered in the schools and its adaptation to the needs of the people. Provision is made for the training of teachers in vocational subjects in the College of Agriculture, in the Normal School, in the Vacation Assembly, and through the supervision of teaching by the officers of the Bureau of Education.

Several types of schools especially designed to train farmers have been developed. These schools grade from the provincial secondary or intermediate school, with dormitory accommodations for the students and farms of more than a thousand acres in area, to the farm settlement primary schools in which half the time of the pupil is spent in practical field work. Instruction in vegetable gardening is a requirement of all the schools of the islands with the exception of those which give other trade or industrial courses. Nursery work is a feature of all intermediate school gardens. Every year almost 50,000 ornamental trees and shrubs and more than this number of fruit trees are propagated by the pupils and distributed among the farmers. There are 3,100 school gardens in the islands, and 39,900

home gardens conducted by school pupils under direct supervision. There are 6,000 boys and 1,800 girls receiving instruction in gardening.

Work in domestic science and household arts is also well developed in general. In the congested regions, instruction in household industries should receive the same emphasis that agricultural instruction has received in some of the partly developed agricultural regions of the Philippines. A provincial trade school devoted exclusively to the development of handicraft manufacture should be established in the city of Cebú.

THE SOLIDARITY OF THE PEOPLE

It is unfortunate for any country to be divided by mountains, seas, swamps, lakes, rivers, or other obstacles to the free intermingling, intertrading, and intermarrying of its people. A people divided into small groups, with different traditions and unequal opportunities, develop unevenly. Japan, with a backbone of mountains, has maintained the solidarity of her people by a uniform language, a strong government, and in recent years a well-organized system of public schools and a well laid out system of highways and railways. China, neglecting those agencies which facilitate the intermingling and intermarrying of the people, has not yet developed beyond the tribal state. The Philippines, with their thirty more separate islands, with the many different dialects and languages, with poor means of transportation, have not yet advanced far toward solidarity although considerable progress has been made in recent years.

Along with efforts to provide a better diet and to promote solidarity of the people should go efforts to prepare them for better ways of living. Racial pride should be quickened; proper forms of recreation should be provided and institutions like the University of the Philippines, the Bureaus of Education, Health, Agriculture, and Science should be highly developed. These institutions should be made capable of carrying not only the work of the Philippines, but also a part of the work of the world. It may be said that the Filipinos are already weighed down with public burdens, but the sacrifices for the common good a people always finds its principal source of strength.

THE PAMPA OF ARGENTINA

By WALTER S. TOWER

University of Chicago

Few regions in the world affect the observer as does the Pampa of Argentina. Only by crossing and recrossing it can one appreciate fully its apparently infinite distances and get that impression of vastness which comes in mid-ocean and in great deserts where one gazes interminably at the horizon. One must see it to realize the almost boundless expanse of grass-covered plain, originally with hardly a tree or a bush to vary the scene over the endless miles which stretch away to an unbroken horizon. Here, valleys and rocks and sparkling streams are meaningless names, and all the world, so far as one knows, is a monotone of green.

Where man has planted them, trees grow well and, like the bulky eucalyptus, stand up boldly against the sky, quite out of harmony with the dominant flatness, with an effect much like that obtained by grafting a Gothic spire on one of the horizontal, patio houses of a Pampa *estancia*. Ranch houses, too, may notch the skyline, but always in a way which brings into relief their insignificance and their isolation. Lone windmills, like giant skeletons in full stride, suggest a touch of the unreal. Here and there an expanse of water appears, half concealed in its swale, behind rank borders of rush and sedge, shallow and uninviting, but flaming with the gay plumage of water fowl. In the distance are cattle or sheep or a patch of yellow where a ripening grainfield tells of man's effort to conquer these vast spaces for his own enrichment.

EXTENT

The common use of the word *pampa* makes it almost synonymous with "plain." In Argentina, however, *La Pampa* is a name applied to only a part of the plains (*pampas*) which are so extensive in that country. As the Argentino thinks of it, the Pampa is an area of about 250,000 square miles, lying mainly between 30° and 40° S., and extending from the Atlantic coast westward for a maximum distance of about 400 miles. The eastern limit follows the coast and the Rio Paraná, while the landward limit, marked by the transition from grass to bush or forest, is a curved line running from the coast south of Bahia Blanca northwestward into the province of San Luis and thence northeastward to the Rio Paraná above the city of Santa Fé (Fig. 2). Within these limits are included all of the province of Buenos Aires and parts of the provinces of Santa Fé, Córdoba, San Luis, and Pampa Central. By some the southern part of Entre Rios province would be included, but that is a somewhat different type of region.



Important Aspects

DRAINAGE

The general idea of the Pampa as a great grassy tract, low, flat, and fertile, carries only an inadequate concept of what the region really is. Other aspects such as location, drainage, climate, and the landscape of the region are no less important. Any map of the region (Fig. 2) will show how open

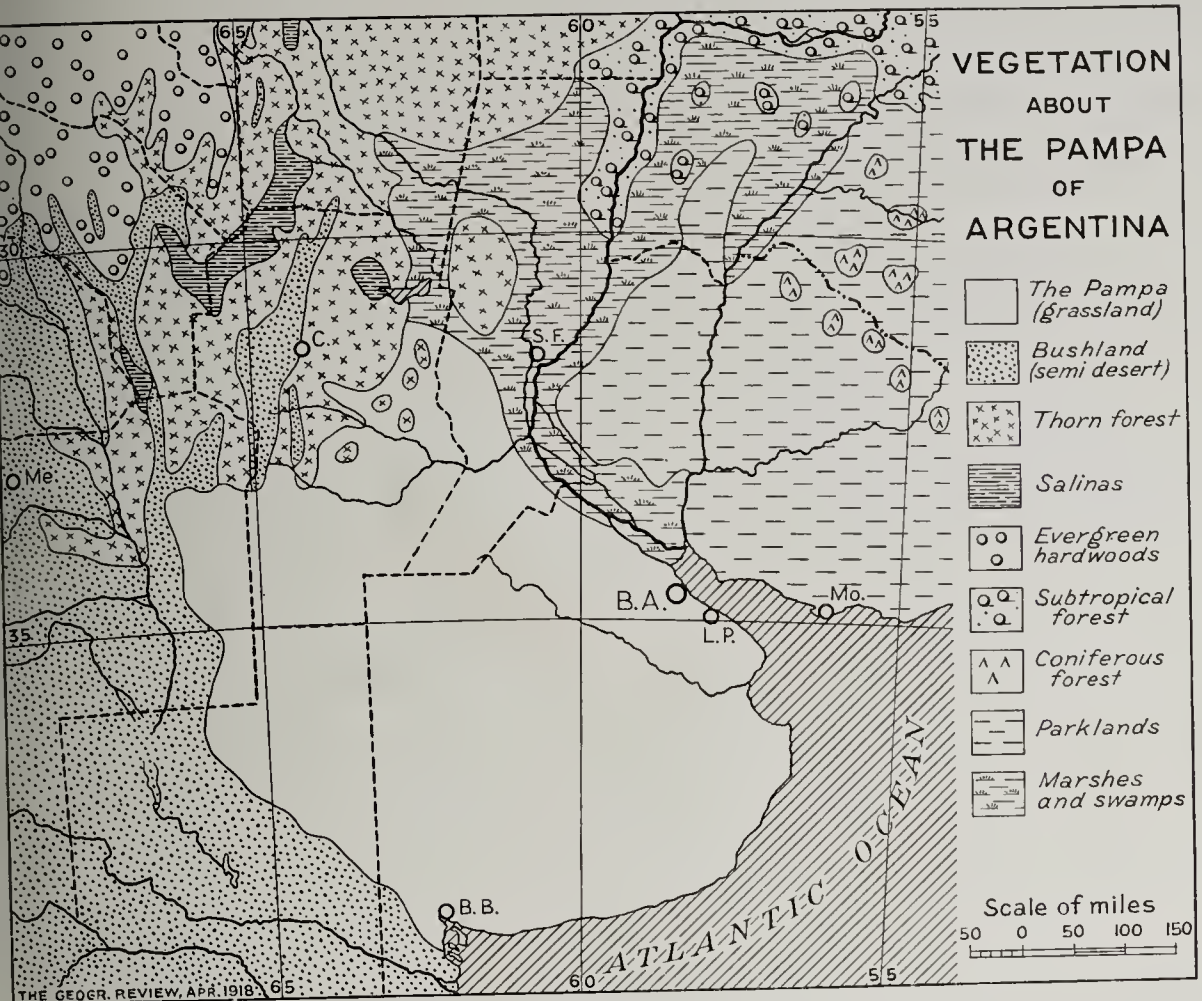


FIG. 2—Sketch map of the vegetation about the Pampa of Argentina. Scale, 1:15,000,000. Modified from vegetation maps of South America by M. E. Hardy (Oxford Wall Maps) and J. F. Unstead and E. G. R. Taylor (Philips' Comparative Series of Wall Atlases). Abbreviations: B. A., Buenos Aires; L. P., La Plata; S. F., Santa Fé; C., Córdoba; Me., Mendoza; B. B., Bahía Blanca.

its eastern margin is to approach from the ocean and by the deep lower course of the Paraná, giving the Pampa an unsurpassed location with reference to great natural highways.

On the other hand the Pampa is so low, so flat, and so young that no large rivers and few small ones flow through it to extend the natural routes of transportation toward the interior. Thus in the course of about 400 miles the Paraná receives only two sizable tributaries, the Rio Carcaraña and the Rio Salado, neither of them readily navigable; while only a few small, non-navigable streams (like the Salado of Buenos Aires province) enter the ocean and the estuary. As a result of the small number and diminutive size of the streams, seasonal or permanent wet lands are found

in most sections, especially toward the coast, where they have retarded farming (Fig. 6), and the importance of underground water supplies to man and animals is greater than in many other plains.

CLIMATE

A good climate is another important aspect of the Pampa. The maximum in mid-summer may run high, but the normal temperatures for the warm season are not extreme (Table I). On the other hand, in winter, there are

TABLE I—TEMPERATURE DATA FOR TYPICAL PAMPA STATIONS
Mean Monthly (in degrees Centigrade)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Ceres (north).....	25.5	24.8	22.0	18.8	15.8	13.1	12.9	12.9	17.2	19.2	21.7	24.4
Bahia Blanca (south).....	21.5	21.0	18.9	15.2	11.2	7.7	7.5	8.5	11.4	13.9	17.4	19.7
Buenos Aires (east).....	23.1	22.8	20.9	16.6	13.3	10.6	10.1	11.3	13.4	16.1	19.6	21.9
Victorica (west).....	23.9	21.9	18.5	14.7	10.5	7.5	7.2	7.6	11.6	14.5	18.8	21.9

	<i>Mean Minima</i>					<i>Absolute Minima</i>	
	MAY	JUNE	JULY	AUG.	SEPT.		
Ceres	10.1	7.4	6.4	5.7	9.2		—7.
Bahia Blanca.....	7.1	4.5	3.7	3.8	6.3		—5.2
Buenos Aires.....	8.2	5.7	5.8	5.9	7.7		—5.
Victorica.....	4.5	0.5	0.5	1.3	4.3		—11.

few places that can ever properly be described as cold (minima, Table I). Snow is uncommon over most of the Pampa and is unknown in much of it. Palms grow very well in the open squares of Buenos Aires (34° S.), common vegetables may be seen growing thereabouts every month in the year, and plowing and seeding may be done in midwinter.

RAINFALL

The rainfall of the Pampa is moderate to light, decreasing enough from coast to interior (Fig. 3) to make the western margin semi-arid, for there the amount (less than 16 inches) will support only drought-resisting plants. It must be remembered, however, that while the rate of evaporation is typically high, most of the rain comes during the warmer six months, the removal of rain by surface run-off is unusually low, and the water table is within a few feet of the surface. Thus the availability of water for plants probably is greater than in many other areas receiving like amounts of rain. As in all such regions there are sharp oscillations of rainfall, above and below the normal (Fig. 4), with consequent periods of abundance, separated by years of drought and crop shortage. One of these fluctuations and its effects on a staple crop are shown in Table II. The seasonal distribution of rainfall ordinarily insures an almost ideal harvest time, but now and then persistent heavy rains may cause much damage to ripening crops. Thus a striking combination of favorable aspects makes the Pampa stand out conspicuously among the famous plains of the several continents.

TABLE II—VARIATION IN RAINFALL, CORN CROP, AND EXPORT

YEAR	RAINFALL OF GROWING SEASON	AREA SOWN	PRODUCTION	EXPORT
1905-06.....	462 mm.	2,717,300 hectares	4,951,000 tons	2,693,000 tons
1906-07.....	268 mm.	2,851,300 hectares	1,823,000 tons	1,276,000 tons

Handicaps to Progress

EARLY SETTLEMENTS

With almost ideal conditions for colonization afforded by easy access from the Atlantic to vast grassy plains with a desirable climate, this Argentine Pampa should have become an important center for European population early in the development of South America. As a matter of fact, soon after the discovery of the continent, glowing accounts of the region, brought back by such explorers as De Solis and Cabot, led the Spanish to make plans for the occupation of the lands about the Rio de la Plata. The first attempt to establish a colony at the site of Buenos Aires (about 1536) failed, as did a second venture at the same place six or seven years later, presumably because the sites along the estuary, unprotected by any barrier, were untenable by a small colony in the face of hostility from the Indians.

After the failure of the early ventures at Buenos Aires, thirty years elapsed before the founding of Santa Fé (1573) by settlers from Asunción. This marked the beginning of permanent European occupation of the region. Whether Santa Fé succeeded because the site near the mouth of the Salado was better protected than those on

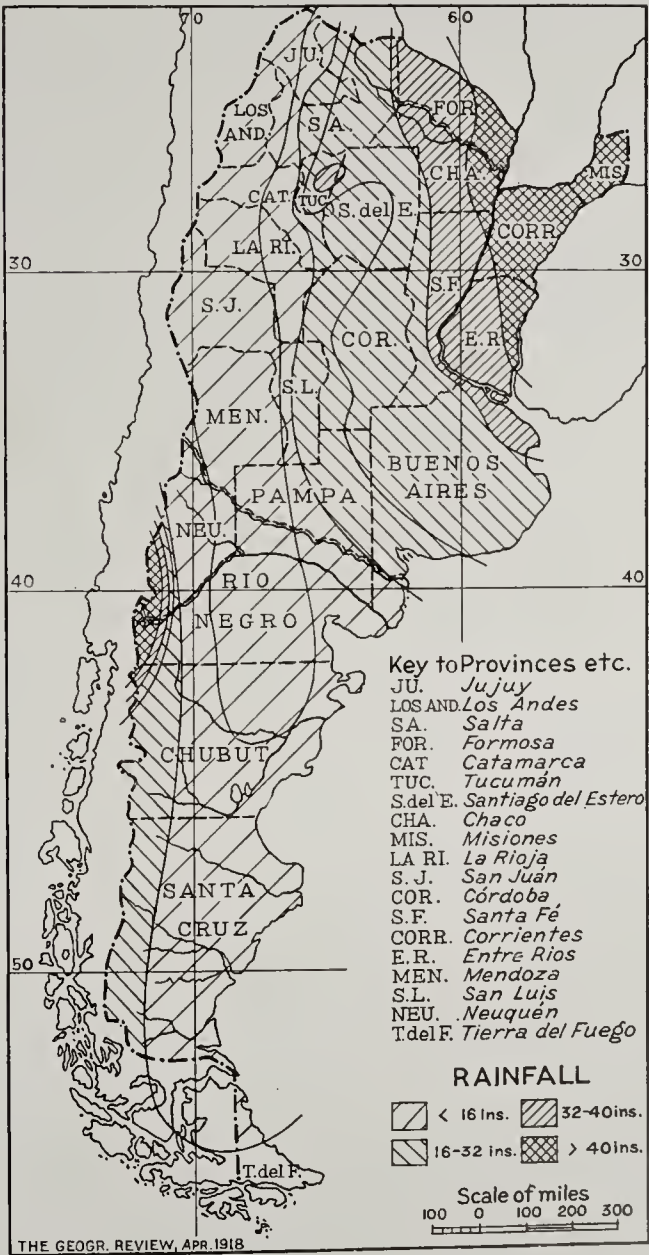


FIG. 3—Sketch map of the rainfall of Argentina. Scale, 1:32,000,000. Based on Pl. 17 of Walter G. Davis' "Climate of the Argentine Republic" (in Vol. 3 of the "Agricultural and Pastoral Census of the Argentine Republic in 1908," Ministry of Agriculture, Buenos Aires, 1909).

the estuary, or Indian opposition was less in the north, or the Spanish power was stronger, cannot be determined, but the Santa Fé settlers soon found that their main support lay in hunting the wild cattle and horses which had multiplied to great numbers from the animals left by the earlier colonists.

The river route naturally favored the extension of settlement southward from Santa Fé. With the need for a town on the estuary a third attempt at Buenos Aires (1580) proved successful, the same site having been chosen each time because it was about the only place where the shore was not marshy and where the mouth of a small stream provided some shelter for

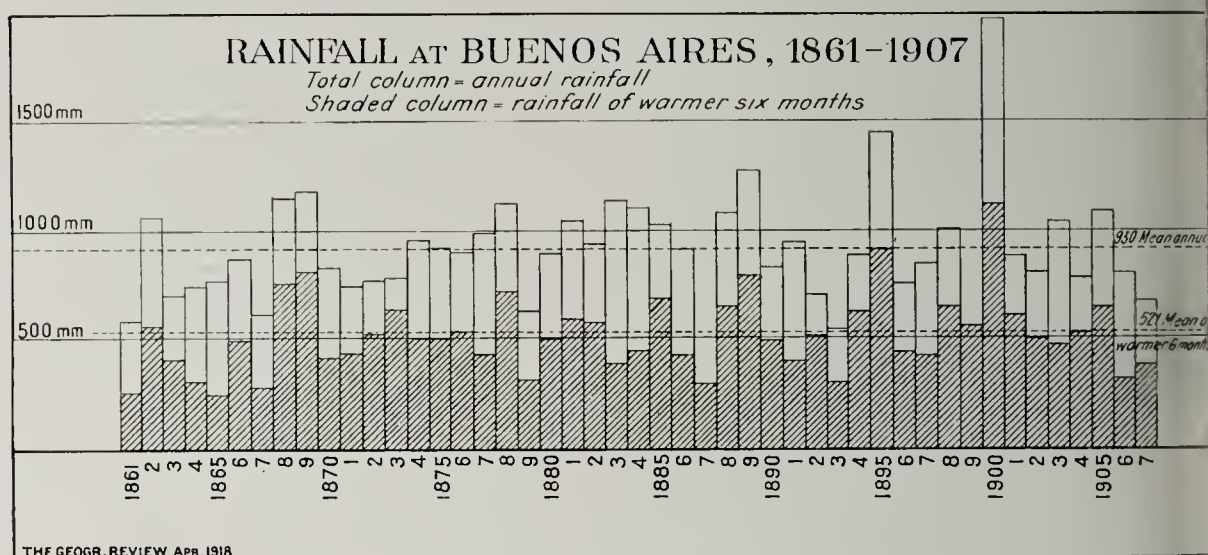


FIG. 4—Graph of rainfall at Buenos Aires, 1861-1907. Based in part on Pl. 26 of W. G. Davis' "Climate of the Argentine Republic."

boats. Thus there began, in the last quarter of the sixteenth century, the Spanish occupation of one of the best parts of their vast colonial empire. Most of the time which has elapsed since then, however, has been marked by comparatively little change from the conditions surrounding those earliest settlements. Population increased and spread slowly from the river towns toward the interior, but dependence on animal products continued to be almost the sole basis of support.

TRADE LIMITATIONS

For nearly three centuries after the founding of Buenos Aires, there was not much chance for the Pampa to develop trade in crop products. Whatever the condition of Spanish administration and the inclination of the colonists might have been, they could not have changed the fact that world trade in agricultural products was comparatively small in those times, was mainly not in the kinds of products for which the Pampa was best suited, and, so far as needed, such crop products as the Pampa could furnish were readily supplied from places closer to the markets. However, the lack of staples of trade must not be emphasized too strongly in account-

ing for the backwardness of the region, because the pastoral products were from the beginning, and increasingly as time went on, in demand in European markets, if not elsewhere; and few places were then, any more than they are now, more favored by nature than was the Pampa for production and trade in such goods.

CONTRABAND TRADE

Thus, although the first settlers found a convenient basis of existence in hunting the animals which then roamed the grasslands, few of the products could be handled profitably over the prescribed route via the Isthmus of Panama to Spain. A less restricted trade was necessary if the settlements were to live; hence comparatively early a contraband trade was carried on through the convenient river ports or Buenos Aires, by which means the people of the Pampa disposed of their surplus (hides and skins mainly) and secured at not too exorbitant prices those European goods which they needed. Only through contraband trade could the region progress even as slowly as is known to have been the case; but illicit intercourse developed many undesirable conditions, from which the region recovered slowly, and it stimulated no such growth as would have come from freedom of trade through the Pampa ports.

REMOVAL OF RESTRICTIONS

The far-reaching effects of the various handicaps, mainly political, appear in many aspects of colonial development. Thus the early importance of the interior sections of Argentina, such as arid Mendoza (then the Cuyo province of Chile) and Tucumán, appears to have been fully as great as that in the much more favored Pampa section. Later the progress in the Pampa was much more rapid, when some of the restrictive regulations were removed (1774-1778) and trade was permitted direct from Buenos Aires to the home country, as well as to the other colonies and foreign countries. The trade and the population of Buenos Aires are said to have shown in twenty years a development much greater than had been wrought in the preceding two hundred years. It is true, of course, that the conditions of world trade had changed during the long period of restricted intercourse; but it is undeniable that the removal of restrictions permitted for the first time the trend of events to be directed by the natural advantages of the region.

POLITICAL TROUBLES

Unfortunately, however, the influences of natural advantages were unhampered for only a few years, when they again were thrust into the background by the conditions incident to the War for Independence and the subsequent interval of domestic trouble. During the first half of the nineteenth century the course of events, again largely political, kept nearly stationary all aspects of material development. This stagnation is indicated

by the growth of population from an estimated number of 800,000 or 900,000 (about 1800) for the whole republic to not more than 1,250,000 some sixty years later, a rate of increase slower than what natural increase normally would provide. Buenos Aires, too, stood nearly still in spite of the new opportunity to serve as the commercial center for a wide area surrounding the Pampa, from Mendoza to Paraguay; for, whereas the city is credited with an increase of more than 30,000 population in the last two decades of the eighteenth century, its increase in the first three decades of the nineteenth century is estimated at little more than 10,000. In fact, as recently as 1870 the conditions in the Argentine Pampa were but very little different from those surrounding the simple pastoral communities which had been started three hundred years before. It is true there were more people. A new type, the *gaucho*, with a picturesque dress to suit his life in the saddle, had been produced. There were more animals; sheep were raised along with the cattle, and animals were now private property instead of wild herds. Cities had been founded and had grown, both along the river and farther inland. Trade had increased in variety and in volume. But the development was largely a difference of degree rather than kind and nowhere approached what the natural advantages of the region would permit.

Influences in Recent Development

The modern aspects of Pampa development began (about 1870) with the appearance of new forces which released the region from its long period of stagnation. Prominent among those forces were the final settlement of domestic political problems, the improvement of transportation, both internal and external, the beginning of new and much larger immigration (especially Italian), fencing of the grazing lands, increased planting of forage crops (especially alfalfa) for fattening cattle, and the expansion of world markets for agricultural and pastoral products. All natural advantages now were free to operate, so that the tendencies since that time have revealed the true character of the region.

POOR TRANSPORTATION

Lack of efficient means of transportation always had been one of the great handicaps for the places more than a score or so miles away from the ports. The closure of the Paraná to foreign craft (prior to 1854) had lessened the influence of that highway. Absence of navigable streams intersecting the Pampa made land haul the only means of transport until railroads appeared (after 1857). Land travel was difficult, especially in wet weather, because imperfect drainage, deep, fine soil, and lack of road building material made it impossible to develop a system of good wagon roads. Thus poor transportation had helped to keep the whole region dependent on pastoral activities.

RAILROADS

The advent of railroads, therefore, here even more than in the prairies of the United States, opened new prospects for a vast fertile region. From the beginning, Buenos Aires was the chief center from which railroads radiated to the west, northwest, and south; so that to the advantages which the city enjoyed naturally, because of its relationship to the river routes and the head of the estuary, there were added the benefits of an ever lengthening mileage of railroads through the Pampa. Flatness of surface, absence of valleys or streams to be crossed, mildness of climate, all contributed to ease and economy of construction and operation of railroads. But on the other hand there were some serious disadvantages arising from the necessity of importing nearly all the materials for construction (except ties) and the rolling stock, and from complete dependence on foreign supplies of fuel. Despite these drawbacks, however, lines soon tapped nearly all parts of the Pampa and now make a complete network, with the principal center at Buenos Aires (Fig. 6), and others at Rosario, Bahia Blanca, and Santa Fé, thus providing each part of the region with its own convenient outlet for ocean shipment. Of the total mileage of railroads in the republic in 1914, approximately 65 per cent (14,000 miles) is in the Pampa, making it the only part of the country, and one of the few sections of the continent, that has any approach toward adequate transportation facilities. Shortness of rail haul to and from the ports, hardly more than 200 miles for any large area, is now one of the conspicuous advantages of the Pampa.

IMMIGRATION

Railroad building and increase of immigration went hand in hand, and for the first time the growth of population was conspicuous. Attractive as it is, the Pampa had acquired only a small population in nearly three centuries of Spanish occupation. During the colonial period emigration to La Plata settlements seems never to have been encouraged by the Spanish authorities; other nationalities were excluded, and as a result the growth of the European element was very slow. There was no reason among these pastoral people for any large number of negro slaves, and the native Indians of the region were less inclined than tribes elsewhere to racial admixture with the conquerors. As a result, fortunately for the future republic, Argentina entered its period of independence with a very sparse population, not exceeding 900,000, probably not more than half of which was in the Pampa. Buenos Aires was the only important Pampa center, with not more than 30,000 people. During the first decades of independence, also, population grew hardly more than the natural increase would provide, and immigration was so small as to be negligible. Domestic conditions in Argentina and the superior attractions of other places, especially the United States, may be held mainly responsible for this almost complete lack of immigration into the republic until after 1850. About that time,

however, a steady influx began. Conditions in some of the European countries, especially Italy, were such as greatly to increase emigration. The opportunities in the Pampa became more and more attractive to Europeans, especially those of Mediterranean lands; and so, within two decades, tens and then scores of thousands of immigrants were being welcomed annually, nearly all of them settling in the Pampa or its commercial centers.

FARMING

This rapidly increasing population offered a larger supply to labor than the pastoral activities required or could absorb. The development of farming followed then as a natural result of improved transportation and greater population. Farming also was stimulated by changes outside of Argentina, which increased the markets for the kinds of crops which the Pampa would produce most readily, that is, the cereal crops of middle latitudes. The progress of manufacturing and accompanying aspects of development (after the middle of the nineteenth century) forced western European countries to become habitual importers of foodstuffs, a tendency which became marked during the years when the Pampa was being opened to farming. There also was in neighboring sections of South America, especially in Brazil, opportunity for disposing of increasing amounts of flour, grain and meat. Expansion of leather-working and woolen industries led to more demand and better prices for the old staples of trade, while the introduction of refrigeration changed the whole future of meat production, by making possible the shipment of fresh (frozen or chilled) meat across the tropics to northern markets. Sheep carcasses heretofore largely rendered into tallow (if used at all) now became salable as frozen mutton, and cattle previously shipped alive (with large losses) or in the cheap form of dried and salted beef (*tasafo*), now could be slaughtered locally and the meat sold at rising prices in more exacting markets.

The Progress of Grazing and Farming

The effect of all the new forces, appearing within a space of twenty years, was, first, to open a new era for the old pastoral activities of the Pampa, indicated by the increase in the number of cattle and sheep in the republic (Table III), most of this increase being in the Pampa (Figs. 13 and 14).

TABLE III—INCREASE IN NUMBER OF CATTLE AND SHEEP IN ARGENTINA

YEAR	NUMBER OF CATTLE	NUMBER OF SHEEP	YEAR	NUMBER OF CATTLE	NUMBER OF SHEEP
1864*	10,215,000	23,000,000	1895.....	21,700,000	74,379,000
1870*	(?)	41,000,000	1908.....	29,116,000	67,211,000
1880*	14,171,000 (1884)	61,000,000	1912*	29,016,000	80,401,000
1888.....	21,961,000	66,701,000	1916.....	30,796,000	81,185,000

* Estimated.

and, second, and more important, to start the period of cereal farming which typifies the present.

INCREASE OF CULTIVATED AREA

In spite of excellent opportunities for raising a variety of crops, the Pampa communities had been for many years importing common food-

TABLE IV—INCREASE IN ARGENTINE POPULATION AND AREA TILLED

YEAR	ACREAGE OF CROPS	WHEREOF IN PAMPA PROVINCES	POPULATION	WHEREOF IN PAMPA PROVINCES
800.....	(?) acres		800,000 (?)	
857.....	506,000 (1864)		1,160,000	
872.....	1,450,000	57%	2,231,000	51%
888.....	7,430,000		3,158,000	
895.....	12,000,000	77	3,954,000	61
910.....	46,700,000	89	7,171,900	69
915.....	60,000,000 (approx.)		7,950,000 (approx.)	

stuffs. Wheat and wheat flour, for instance, were sent regularly from southern Brazil to the Buenos Aires market as late as 1870. Not as much as one acre per capita was then under cultivation in the republic (Table IV), and of the Pampa only the northernmost parts had been touched, mainly to raise corn. When the change came, however, the acreage cultivated increased with amazing rapidity (Table IV), for in the first twenty years of expansion the area of crop lands increased more than fourfold, and in the next twenty years the increase was more than fourfold again. In forty years the area tilled has risen from less than one acre to nearly eight acres per capita. This present figure is extraordinary, because it is exceeded in no other country in the world and was reached during a period of rapid growth of population. Concentration of farming in the Pampa, and the failure of its progress to be reflected by adjacent areas, is shown by the distribution of cultivated land (Fig. 5) and the percentages of Table IV.

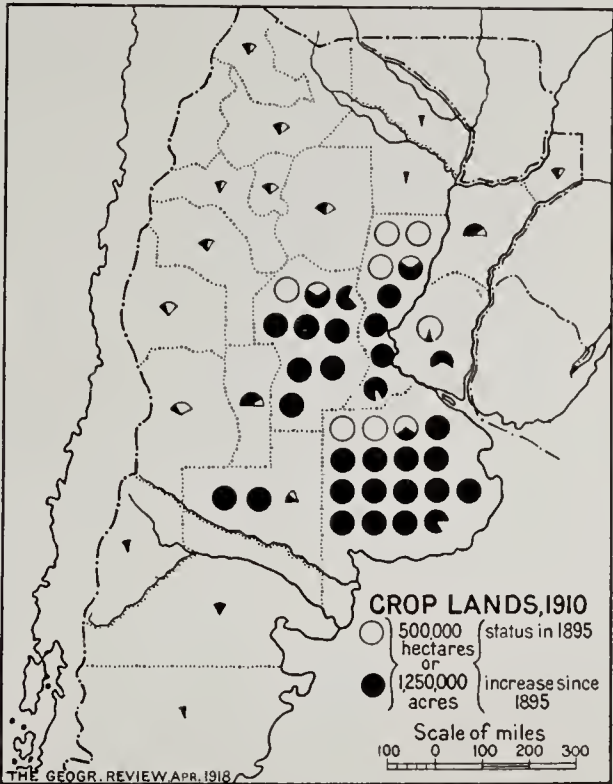


FIG. 5—Cartogram showing the distribution of crop lands in Argentina in 1910 and their increase since 1895. Scale, 1:36,000,000. For province names see Fig. 3. Figs. 5-8 and 13-16 are based on the "Agricultural and Pastoral Census of 1908" and the annual "Agricultural Statistics" published by the Argentine Ministry of Agriculture.

CHARACTER OF CROPS

Most of the development has been of the simple sort, typical of humid grassy plains in the early stages of tillage. Cultivation of large tracts by machine methods, greatly favored by the nature of the region, small average

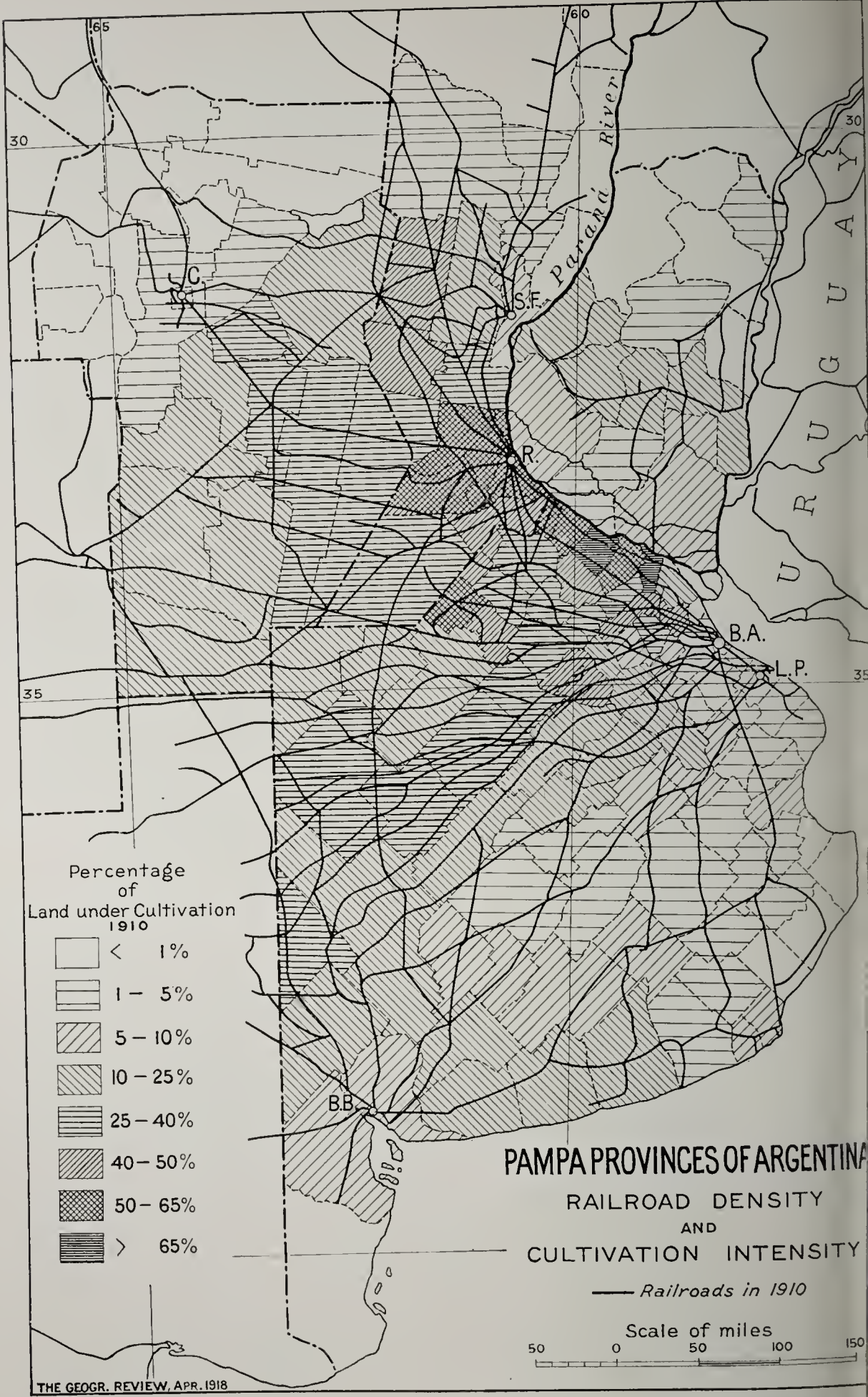


FIG. 6—Sketch map showing the railroad density and the cultivation intensity of the Pampa provinces of Argentina. Scale, 1:7,250,000. Abbreviations as in Fig. 1. R.=Rosario.

fields, and dependence on a few easily marketed crops are characteristic of all parts. Wheat, corn, oats, flax, and alfalfa almost monopolize the crop and of the Pampa (Fig. 7), the distribution and extent of the several crops being shown by Figure 8, which shows also the small share of these crops belonging to the rest of the republic. Cereals, however, are not the only crops for which the Pampa is adapted, for its location gives it the climatic conditions under which subtropical and middle-latitude products meet. With labor available, the northern edge might raise much cotton, being similar to the Texas cotton belt (Table V); tobacco can be raised widely;

TABLE V—CLIMATIC DATA FOR CERES (NORTHERN MARGIN OF THE PAMPA)
AND WACO (TEXAS COTTON BELT)

Temperatures—Mean Monthly (in degrees Fahrenheit)

	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APRIL	MAY
Ceres	56	55	55	63	66	71	76	78	77	72	66	60
	DEC.	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.
Waco	52	48	51	58	67	75	82	85	85	78	67	57

Rainfall—Mean Monthly (in inches)

	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APRIL	MAY
Ceres	0.4	0.5	0.8	1.1	2.5	3.5	4.2	4.5	4.6	4.5	3.2	1.1
	DEC.	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.
Waco	2.7	1.9	2.9	2.4	3.9	4.3	4.5	3.2	2.1	2.2	3.1	2.2

and all the common field crops, vegetables, and nontropical fruits will find satisfactory conditions. So far, however, most of these possibilities have little or no place in the region, and it seems somewhat paradoxical for the Pampa to be sending great amounts of breadstuffs to Europe, while it buys potatoes from France, eggs from Italy, and canned foods of all sorts, at high prices. The chief reason for this condition probably is that development has not yet reached the stage which would make diversified crops logical parts of the average farm activity. But as agricultural evolution goes forward, the Pampa must become an even more important factor in the production of foodstuffs and other staple crops.

PROBLEMS

In spite of its rapid expansion, Pampa farming has some serious problems still to be solved before it can reach its highest development. Transportation, labor, extent of lands too wet for crops unless artificially drained, methods of production and handling of crops, losses of various sorts, the presence of enormous land holdings, and the persistence of the grazing interests, all present conditions which are unfavorable to a speedy realization

of the full possibilities of the region. Thus with only about one-third the available area under crops, it may be a long time before farming covers as much of the Pampa as it should.

HANDLING PRODUCTS

Facilities for handling crop products still are far from adequate. The lack of elevators compels the handling of grain in bags (Figs. 9 and 11),

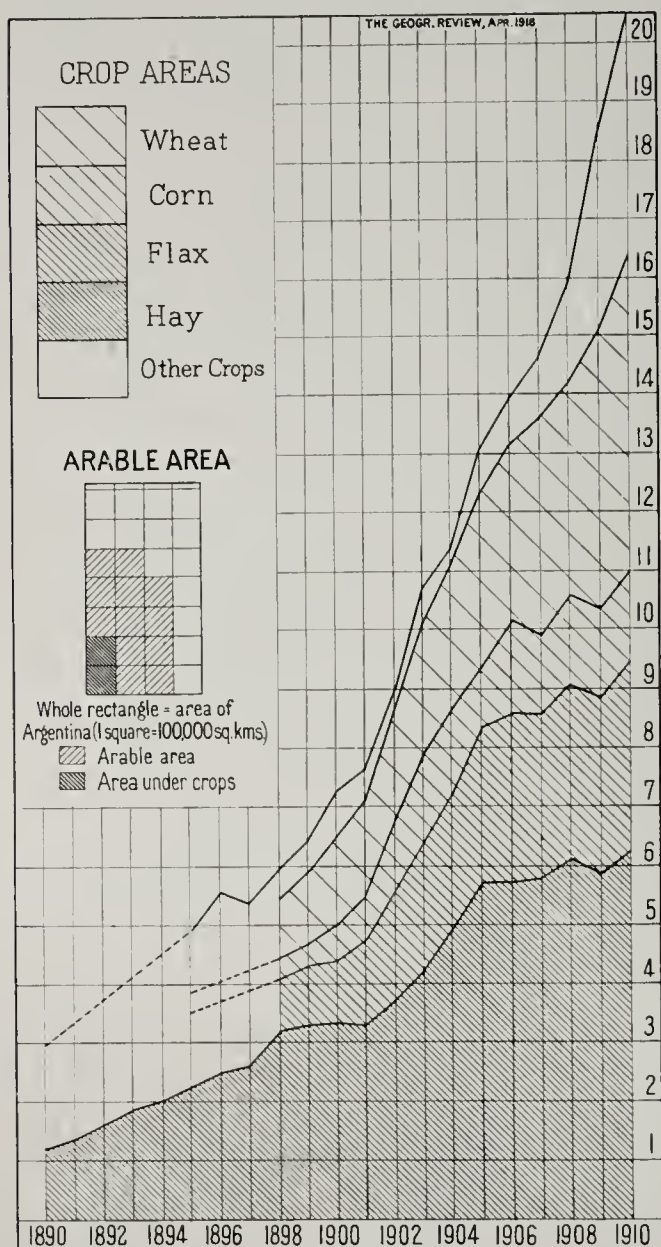


FIG. 7.—Graph showing the areas in millions of hectares (1 hectare = $2\frac{1}{2}$ acres) devoted to the principal crops in Argentina from 1890 to 1910. The inset represents the ratio of cultivated and arable land to the total area of Argentina.

enough to cultivate upwards of 160,000,000 of acres. In fact, the harvest now is completed only with the help of migratory laborers from Italy and Spain, the number of these seasonal immigrants running as high as 150,000

which costs the farmers millions of dollars (from \$12,000,000 to \$15,000,000) a year and commonly involves much loss of grain in handling. Storage of corn, on the farms, in the primitive cribs (*trojes*) made of corn-stalks (Fig. 10), paves the way for severe damage when the after-harvest season is marked by unusually abundant rain. The needs of most sections cannot be met by the long hauls over poor roads to railroads congested with after-harvest traffic. More railroads, a system of country grain elevators, and more storage capacity in the ports depend only on interesting more capital in such enterprises; but building a system of good roads is a very different problem, inasmuch as fine soil, poorly drained flat land, and lack of road-making materials are the rule.

SEASONAL LABOR

The population is much too small to cultivate all the land that is available. It is inconceivable that only about 6,000,000 people (the total in the Pampa) could provide labor

in normal years. Agricultural colonizing is encouraged by both public and private interests, but progress through these agencies has been slow, because of the high prices demanded for land.

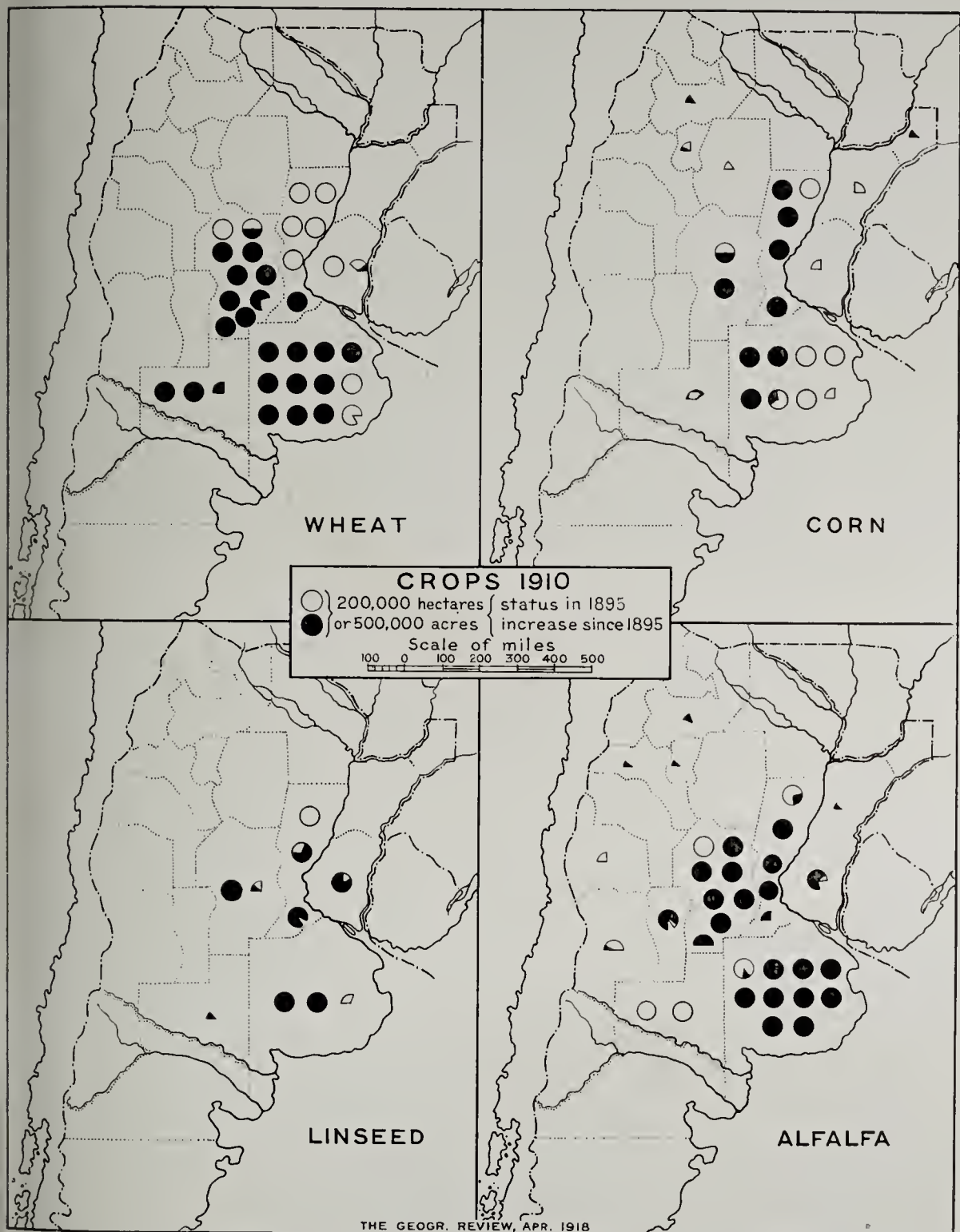


FIG. 8—Four cartograms showing the distribution of the wheat, corn, linseed, and alfalfa crops in Argentina in 1910 and their increase since 1895. Scale of each, 1:36,000,000.

DROUGHTS AND LOCUSTS

Liability to drought and locust plagues, expectable in all such new regions, has perhaps helped to discourage farming in some sections. The



FIG. 9.



FIG. 10.

FIG. 9—A Pampa road in dry weather, and grain on the way to the railroad.
 FIG. 10—A corn crib (*troje*), and the preparation of corn for shipment.



FIG. 11.



FIG. 12.

FIG. 11—Typical after-harvest scene at the railroad station. Thousands of tons of grain in sacks stacked in the open.

FIG. 12—The water front at Rosario, one of the Pampa ports on the Rio Paraná. Note the high bank which determined the location of the city.

drought factor, however, is less serious than some seem to believe and presumably will diminish as farming methods are improved. Losses from unseasonable heavy rains are perhaps just as serious but not so prominently mentioned. Invasions of locusts have led to serious losses at times; but, judging from other cases, that factor will disappear as tillage is extended widely and adjacent areas are populated.

LARGE ESTATES

Enormous estates (*latifundia*), reckoned in hundreds of square miles, are common to all parts of the Pampa—a logical heritage from a pastoral era. Many of these estates are made up of land that is ideal for cereals but bears no crops to be harvested. Subdivision of some of these great tracts is going on, as shown by recent investigations, but less rapidly than is desirable; while, on many estates, tenant farming is encouraged, mainly as a means of extending alfalfa lands for fattening cattle. Various reasons may account for such a condition. The profits from cattle or sheep raising, conducted on the gigantic scale typical of these *estancias*, may give the owner

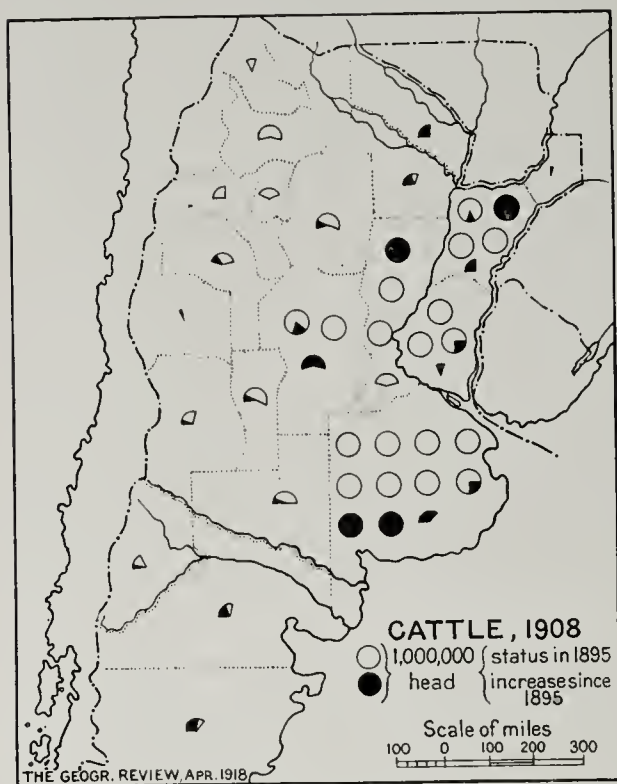


FIG. 13—Cartogram showing the distribution of cattle in Argentina in 1908 and their increase since 1895. Scale, 1:36,000,000.

an income large enough to gratify all desires. Hence there is little incentive for such owners either to embark in farming or dispose of their land to farming colonists. Other great cattle and sheep *estancias* persist because they are too far away from transportation to make crop raising as convenient or as profitable as grazing, because the market price of the land is increasing so rapidly as to tempt the owner to hold for still further rise in prices, because labor is unavailable, and so on. Of all the problems confronting agricultural expansion, this one of size of holdings is probably the most serious because it seems to be the most difficult to remedy. Just as long as the large estates persist much of the Pampa will remain untilled, and much of the area tilled will suffer from poor methods and the other common ills of tenant farming. There is no public domain in the Pampa to offer immigrants the lure of cheap land; instead, all Pampa land has a price, largely fixed by transportation facilities, rainfall, and level of the water table, but also affected by speculation, and in most cases beyond the reach of the average immigrant's capital.

THE CATTLE INDUSTRY

It is, of course, impossible to bring farming into a pastoral region, as the Pampa was, without modifying grazing activities. Thus the century-old practice of range grazing of cattle on native grasses has been replaced by universal dependence on fenced pasturage and the practice of fattening on some introduced forage crop like alfalfa or (recently) corn. These changes have nearly eliminated the picturesque figure of the *gaucho*, a typical product of the Pampa, but they have paved the way for better cattle and larger profits for the *estancieros*. The development of refrigerating plants and packing houses in the ports also has made it desirable to produce a better quality of beef than was available or necessary in the days when the wasteful *saladero* and cheap *tasajo* ruled. Despite these changes and the diversion of some 50,000,000 acres to crops, the Pampa still dominates the cattle industry of the country, the number of cattle there has increased slightly (Fig. 13), and the returns from the industry are nearly doubled. Thus good steers which brought less than \$30 per head in Buenos Aires

fifteen years ago, lately have sold close to \$60, with extra quality priced still higher. Partly as a result of its own progress in beef production and partly as a result of declining surplus elsewhere, the Pampa has become the chief supply region in world beef trade. The development of farming, therefore, has been accompanied by much improvement in the cattle industry, with promise of further advance as forage supplies are increased and more fully utilized. Great quantities of ensilage, incidental to corn production, now largely go to waste, while the natural fitness of the Pampa for dairying has hardly been realized yet.

SHEEP AND SWINE

Sheep raising, on the other hand, shows a marked decline in the Pampa as crops have become more general. In the province of Buenos Aires alone, there were upwards of 52,000,000 sheep in 1895; at the 1908 census there were only two-thirds as many. Other Pampa provinces show a similar tendency, but the Pampa still is the mainstay of sheep raising (Fig. 14).

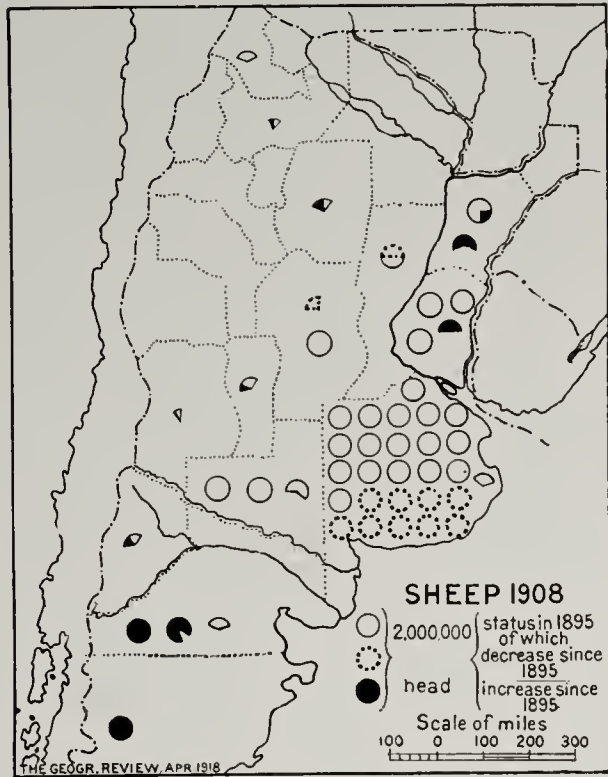


FIG. 14—Cartogram showing the distribution of sheep in Argentina in 1908 and their increase and decrease since 1895. Scale, 1:36,000,000.

Without developments elsewhere to balance the shrinkage in the Pampa, sheep have lost in relative importance in the country, despite better markets and enhanced prices for their products. There has, however, been a considerable development in the southern territories—Rio Negro, Chubut, Santa Cruz, and Tierra del Fuego. It seems not unlikely that further displacement of the sheep industry, until it largely disappears, must result from expanding crop areas, since sheep do not seem to fit as cattle do into a system of general farming. Their place is quite sure to be filled by swine, especially in view of the kinds of crops to be raised and the ready market for pork products. With a mild climate reducing needs for winter housing, simplifying the problem of feeding, and lowering risks of loss from severe weather, cattle and swine raising seem to have an assured place in general farming.

RELATIONS OF PROGRESS TO COMMERCE

The rivalry between crop and pastoral products for first place in the trade from the Pampa did not become acute until about 1900 (Table VI), for up to that time the greater importance always was on the side of the older staples. The ultimate leadership of crop products, however, was as inevitable as the passage of time. They came to the front just about thirty

TABLE VI—AVERAGE ANNUAL VALUE OF AGRICULTURAL AND PASTORAL PRODUCTS IN EXPORT TRADE

YEARS	TOTAL	PASTORAL	AGRICULTURAL
1896-1900.....	\$138,260,000	\$ 83,750,000	\$ 50,350,000
1906-1910.....	344,890,000	135,520,000	198,100,000
1912.....	480,300,000	188,200,000	278,100,000

years after real expansion of farming began, and since about 1905 the margin separating the value of crop exports from the value of animal exports has steadily widened. Thus in spite of the fact that most of the area still is devoted to animals, the Pampa commercially has become in effect a true agricultural region, the developments of three decades having surpassed those of three centuries.

Increasingly efficient use of Pampa resources, for both animals and crops, has greatly stimulated the foreign trade of the country (Table VII)

TABLE VII—GROWTH OF ARGENTINE EXPORT TRADE

YEARS	AVERAGE ANNUAL VALUE	YEARS	AVERAGE ANNUAL VALUE
1861-65.....	\$20,200,000	1891-95.....	\$104,300,000
1871-75.....	42,800,000	1901-05.....	226,400,000
1881-85.....	65,250,000	1906-10.....	344,890,000

because of rapidly increasing surplus (Table VIII), and this growth of trade has lifted Argentina from a secondary position among the republics of South America to undisputed first rank, now far ahead of all former

TABLE VIII—INCREASE IN STAPLE EXPORTS FROM PAMPA CENTERS

	WHEAT AND FLOUR (TONS)		CORN (TONS)		FLAXSEED (TONS)	
	BUENOS AIRES	ROSARIO	BUENOS AIRES	ROSARIO	BUENOS AIRES	ROSARIO
1884.....	34,943	44,203	67,772	3,433	13,474	2,288
1900.....	466,015	808,558	265,856	202,872	55,509	72,668
1908.....	943,760	1,078,360	422,241	766,855	279,374	360,727

rivals. A pastoral Pampa kept the country behind Brazil and close to Chile in commercial importance; but a crop-raising Pampa has given Argentina a place among the first ten commereial nations of the world. Few other countries (only one in South America) equal it in the per capita value either of exports or of imports. Few others contribute so great supplies of food-stuffs to the world's markets, and few others offer a better market for miscellaneous merchandise. Port improvements, costing hundreds of millions of dollars, have been necessary to provide for the constantly increasing traffic, as a result of which Buenos Aires, long hampered by a miserably poor harbor, is now one of the best equipped ports in the world.

EFFECTS ON POPULATION

Agricultural and commercial expansion have provided the basis for a rapidly growing population, which is still far short of the capacity of the country. The population is mainly in the Pampa but is sparse even there (Fig. 16), density of population corresponding closely to percentage of land cultivated (Fig. 15). Large per capita value of trade and great bulk of wares to handle have called for an apparently undue share of the population (about one-third) in the commereial centers, the development of which has gone forward with almost unparalleled rapidity, particularly for those which lie along the Rio Paraná and the coast. Buenos Aires, Rosario, and Bahia Blanca are the chief centers. Buenos Aires alone had attained much prominence prior to the period of expansion, but most of its importance is clearly in the later period, as indicated by its growth since 1888 from 455,000 to more than 1,500,000 inhabitants. It now ranks second only to New York among the ports of the two Americas, and is the second great Latin city in the world. Rosario, a small town in 1870, now is the second city of the republic, with a population of 230,000, and ranks among the leading trade centers of the continent (Fig. 12); and Bahia Blanca has grown in the last twenty-five years from almost nothing to a city of 75,000 inhabitants. The old provinces and cities of the Andean region meantime have been left far behind by this vigorous Pampa growth.

Much of the growth of population has been due to immigration, amounting to upwards of 4,000,000 in the half-century following 1860. The opportunities in the Pampa attracted people of many nationalities, but mainly Italians (2,500,000) and Spanish (850,000). Thus many new elements have been added, with important results: (1) the very small African infu-

sion (from colonial domestic servants) has been submerged to the vanishing point; (2) the *mestizo* type, originally less important here than elsewhere, has been reduced to a negligible fraction; (3) a conglomeration of European elements prevails to a greater degree than in any other section

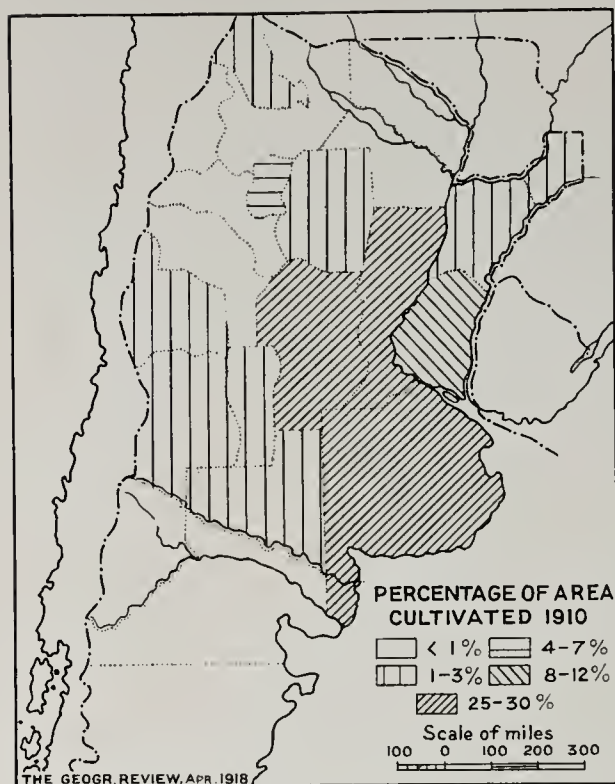


FIG. 15—Sketch map showing, by provinces, the percentage of land cultivated in 1910 in Argentina. Scale, 1:36,000,000.

interests of life find but small place. These aspects of Pampa life, however, are little different from those characteristic of the Illinois prairies in early days. Time should eliminate present drawbacks; and, with good material as the basis and with favorable environment, the Pampa population should ultimately reach as high attainments as are possible in the continent. The only elements of uncertainty appear in the possible effects of monotony of landscape and singleness of agricultural pursuit. Whether these will permit the production of a nation permanently virile and aggressive is still to be proved.

CONCLUSION

The Argentine Pampa may be described, then, as a young, grassy plain, naturally ideal for pastoral and agricultural pursuits, wherein for a long time the primitive grazing interests were dominant and still hold a prominent place, but where steadily they are being forced to give way to the more profitable use of the land for crop raising and scientific breeding of animals. It must be thought of as a region in transition from relatively

of the continent; (4) the present inhabitants of the Pampa are almost as much Italian as Spanish; (5) an entirely new nationality is developing there out of this combination of sturdy European stocks, under conditions quite unlike, but in the main more desirable than those from which the various stocks came.

As yet most of the rural Pampa population is living under conditions involving many disadvantages; except for the *quintas* of the wealthy *estancieros*, dwellings are small and unattractive, presumably because of shortage of supply and cost of building material; comforts, as viewed from standards in the United States, are largely unknown; contact with the outside world is limited; and the higher

small importance to one of great importance in general agricultural production. It is a region in which only a fraction of the possibilities so far as been utilized, but the utilization of that fraction, small as it is, has been sufficient to bring the country into the front rank of agricultural and commercial nations. Within the Pampa are found the larger share of population, of transportation facilities, of productive enterprises, and commercial activities of the republic; so that, however closely the Pampa may have been rivaled by other less favored parts of the country in earlier years, it now stands so far ahead that it completely overshadows all the rest. The Pampa is today unquestionably Argentina, and in that area of approximately 250,000 square miles are found also the main assets on which future Argentine development largely is to be based. With so dominant a part to be played by this region, it seems probable that Argentina will offer an ideal opportunity for observing the evolution of a distinct nationality and its institutions in a great agricultural state.

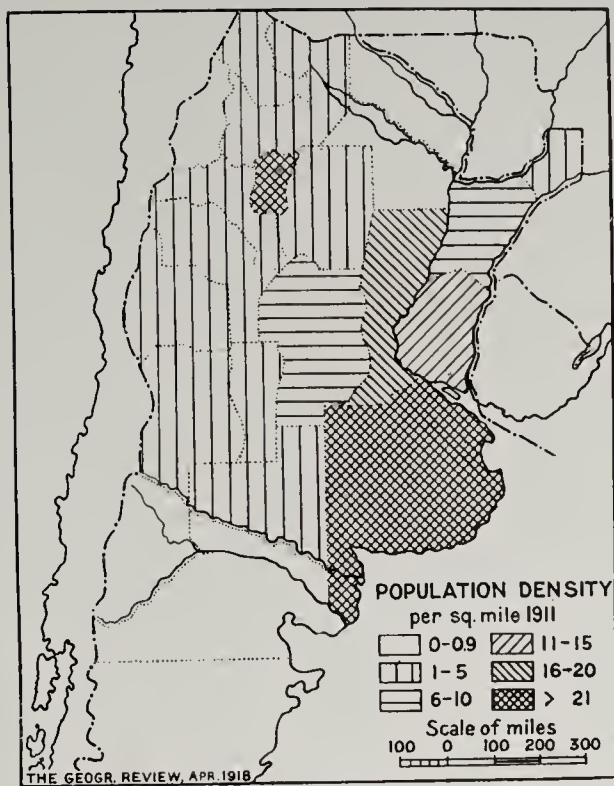


FIG. 16—Sketch map showing, by provinces, the density of population of Argentina per square mile in 1911.

ing the evolution of a distinct nationality and its institutions in a great agricultural state.

THE INFLUENCE OF GEOGRAPHICAL ENVIRONMENT UPON RELIGIOUS BELIEFS*

By R. H. WHITBECK
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In his "History of Mankind" Ratzel says:¹ "Ethnography knows no race devoid of religion, but only differences in the degree to which religious ideas have developed." Tolstoy ("What Is Religion?") is even more emphatic: "... never in any society of men since men first became rational creatures could they live or have they lived without a religion." Notwithstanding such unequivocal declarations, there are reported cases of tribes in Australia, Tasmania, and some islands of Oceania among whose members no evidence of religious ideas could be detected. Such tribes, however, have been exceedingly rare; moreover, the utter absence of religion among them is not admitted by all who observed and mingled with them.² It is almost universally true that mankind, wherever found, has possessed some beliefs that were essentially religious. Among the very lowest of these superstitions is the fetish worship of the negro tribes of Africa. In the main, this consisted of a crude worship of inanimate objects—even stones or pieces of wood—believed to possess some charm or magic.

SCOPE OF THIS ARTICLE

With this or similar irrational superstitions of the lowest races this paper does not deal. Rather is it concerned with religion in the middle stages of human culture; religions which were the product of thoughtful observation of natural phenomena; those religions which represent the human mind groping for an explanation of the seemingly supernatural. Most of these religions belonged to peoples who have a recorded history and who have left a literature, hymns, or sacred books—the Aryans of India, the early Persians, the Egyptians, Hebrews, Norse, and Teutons; or people of more recent time but not high culture whom modern scholars have studied, such as the North American Indians, the Aztecs, the Incas, and the tribes of Central and Northern Asia. Among such peoples, wherever they existed there has always been found a religion befitting their stage of culture and clearly influenced by their geographical environment.

* The writer wishes to acknowledge the assistance of Miss Annie Kirch, formerly a graduate student in the Department of Geology and Geography in the University of Wisconsin; also the criticism of the manuscript by Professor W. L. Westermann of the Department of History.

¹ Friedrich Ratzel: *History of Mankind* (translated from the 2nd German edition), 3 vols., London, 1896-98; reference in Vol. I, p. 40.

² Wilhelm Bousset: *What Is Religion?* (trans.), New York, 1907, pp. 1 and 11.

FACTORS IN RELIGION

Many factors combine to mold a people's religious beliefs. Geographical environment necessarily is one of these—sometimes a conspicuous influence, sometimes only perceptible in minor ways. In certain of the old religions, that of Greece for example, made up of elements borrowed from many sources and modified by the contributions of many peoples through a long past, the influence of geographical environment had nearly ceased to be distinguishable. As a matter of fact, most of the historic religions of the Mediterranean region and southwestern Asia had had a long evolution and had acquired this composite character when we first know of them, yet all of them reflect the influence of the lands and climates in which they grew, and some of them to a notable degree.

Why should it not be so? Would anyone expect a people's religion, or philosophy, or literature to grow up without being influenced by the physical environment amid which it unfolded? In the very nature of things any system of religious belief, in order to grow into acceptance as belief, must be in some sort of harmony with the mode of life, the economic interests, and the geographical environment of the people. It is obvious that if a tribe or group of tribes came to believe in the existence of certain deities, they must have had experiences which engendered these beliefs; for such beliefs grow out of experience, however distorted or illogical may be the deductions from it. No small part of the religions of the type with which we are dealing grew out of man's early attempt to explain the phenomena of nature which he saw about him but which he could not comprehend. For example, he had not the slightest knowledge of why it lightened, thundered, or rained; why the wind blew, or the winter came; why the sun rose and set. To him all such phenomena were mysteries, and he tried to satisfy his mind concerning them by inventing fanciful myths as we now invent more scientific hypotheses.

BASES OF MYTHS

Tylor considers that all myths are early man's inventions to satisfy his desire to know "why?";³ Andrew Lang regards them as savage man's way of satisfying the early form of scientific curiosity.⁴ He says that savages give personality to sky, wind, sun, earth, etc., and think of them as beings of some sort actuated by such motives as they themselves entertain.

Max Müller inclines to the belief that religion grows out of "man's sense of the Infinite as awakened by natural objects calculated to stir that sense."⁵

Bousset says: "Everything that is unusual, strange, or unexpected

³ E. B. Tylor: *Primitive Culture*, 2 vols., London, 1871.

⁴ Andrew Lang: "Mythology" in *Encyclopædia Britannica*, 11th edit., Vol. 19, p. 128.

⁵ F. Max Müller: *Lectures on the Origin and Growth of Religion*, New York, 1891.

attracts the religious attention of the savage Religion rests upon fear of more or less unknown powers which everywhere surround the existence of man."⁶ Frazer states it thus: "A god is always brought in to play the part of a cause: it is the imperious need of tracing the causes of events which has driven man to discuss or invent a deity."⁷

RELATION OF NATURE TO HUMAN LIFE

Early man was impressed by those particular phenomena of nature which seemed most to affect his life. These might be the sun, the rain, the wind, the overflow of a river, or something else. At any rate they would be the elements of his particular environment. The ocean, for example, would not, in the very nature of the case, be expected to play a part in the mythology of the tribes of interior Asia or of Central Africa; but it did play a part in the mythologies of Greece, Rome, and Scandinavia. The annual overflow of a river was a matter of utmost consequence to the people of Egypt; the cause of the periodical rise of the Nile was a mystery, but the people knew that their very lives depended upon it, and the adoration of the Nile inevitably became a part of their religion; but there was no such river to influence the religion of Palestine or Norway or Persia. Again, the occurrence or the failure of the monsoon rains is a matter of plenty or of famine to the people of India, and these seasonal rains could scarcely escape playing a part in the early religions of that country; but to the aborigines of the Amazon Valley, where the rain is so frequent as to be an annoyance, the rain giver might easily be held in disfavor.

FRIENDLY AND UNFRIENDLY GODS

A god is beneficent if he gives us what we in our particular environment most feel the need of, and he is malevolent if he withholds it or sends what we do not desire. Happenings over which man has no control may be either beneficial or baneful to him; he can not account for these except on the supposition that there are good deities and evil ones, and so mythologies always involve the existence of friendly gods and unfriendly ones. The Satan of Egypt, according to Plutarch, was Typhon, a malevolent deity that sent the hot wind and dried up the pools and the soil and parched the vegetation. The Satan of India was Vritra, the serpent which in the form of clouds, caught and held back the rain, for the ancient Hindus thought the rain fell from above the clouds and was caught by them. Indra, the beneficent god, pierced them with his lightning and liberated the rain. In Norway the evil deities were the frost giants (C

⁶ Bousset, *op. cit.*, pp. 35-37.

⁷ J. G. Frazer: *Belief in Immortality* (Gifford Lectures), New York, 1913, Vol. 1, p. 22.

⁸ Plutarch considered that Osiris, one of Egypt's two chief deities, originally typified the Nile, and the land of Egypt, and that their wedding was the overflow of the Nile.

mountains) against whom Thor and Odin and other deities waged relentless war.⁹

It is not surprising that a primitive people should thus associate the phenomena of nature which benefited them with good deities and the phenomena that injured them with bad deities, and that all this reasoning was influenced by the character of the land and climate in which the people lived.¹⁰

VARIOUS HEAVENS

In all religions that recognize a future life, heaven is a place where happiness is to be had; but man's conception of what complete happiness consists in is inseparable from his mode of life, as well as from his stage of enlightenment. To the American Indian's thought heaven was a hunting-ground, abounding in game, and a place to which dogs as well as men might go. The Indian's conception of paradise was born of his mode of living, and that was a response to his particular environment while he was in a certain stage of development—the hunting stage. But his heaven would not be that of pastoral tribes of steppes, of island fisher folk, of agricultural peoples of flood plains, or of nomads in deserts. When James Bryce visited the lofty plateaus of the Central Andes he wrote: "One is never warm except when actually in the sunlight The inhabitants get accustomed to these conditions and shiver in their ponchos, but the traveler is rather stretched after sunset and feels how natural was sun-worship in such a country."¹¹

THE BLESSING OF RAIN

Among the Indian tribes of our Southwest religious ceremonies were notably directed to the securing of rain. The majority of all the ceremonies of the Hopis are for rain and crops, and their prayers to clan or other gods are to secure these things.¹² Summarizing his account of the elaborate ceremonies of the Hopi Indians, whose word for "blessing" is the same as for "rain," Fewkes says:¹³ "The necessities of life have driven man to the agricultural condition, and the aridity of the climate has forced him to devise all possible means at his control to so influence his gods as to

⁹ "The influence that the outward features of a country exercise upon the thoughts and feelings of men, especially during the vigorous, imaginative, poetic, and prophetic childhood of a nation, can hardly be overestimated. Necessarily, therefore, do we find this influence affecting and modifying a nation's mythology, which is a childlike people's thoughts and feelings, contemplating nature reflected in a system of religion." (R. B. Anderson: *Norse Mythology*, 3rd edit., Chicago, 1879, p. 64.)

¹⁰ "The Vedic poems furnish indisputable evidence that such as this was the origin and growth of Greek and Teutonic mythology. In these poems the names of many, perhaps of most, of the Greek gods designate natural objects. . . . In them Daphne is . . . the morning twilight . . . ; the cattle of Helios . . . the light-colored clouds . . . ; Herakles [is] the toiling and struggling sun." (G. W. Cox: *Mythology of the Aryan Nations*, 2 vols., London, 1870; reference in Vol. 1, p. 52.)

¹¹ James Bryce: *South America: Observations and Impressions*, New York, 1912, p. 172.

¹² J. W. Fewkes: *An Interpretation of Katsina Worship*, *Journ. Amer. Folk-Lore*, Vol. 14, 1901, p. 92.

¹³ J. W. Fewkes: *The Tusayan Ritual*, *Ann. Rept. Smithsonian Inst. for 1895*, pp. 683-700.

force them to send the rains to aid him. Wherever we turn in an intimate study of the ceremonials of the Tusayan Indians, we see the imprint of the arid deserts by which they are surrounded, always the prayer for abundant crops and rains for his parched fields." Each environment will breed its own mode of thought, its own philosophy of life, its own religious beliefs.

THE DESERT NOMAD'S PARADISE

In Norse mythology, heaven was a place of warmth and hell a place of cold and mist; but in the religions of Palestine and Arabia, hell is a place of heat—of eternal fire. To the Arab of the desert, paradise was dreamed of as an oasis, or a garden, always having flowing water, shade trees, and fruit. A few of many passages in the Koran will indicate the desert nomad's idea of paradise; Mohammed naturally pictured to his followers the kind of heaven which desert tribes would desire, and so he writes: "This is the description of paradise, which is promised to the pious. It is watered by rivers; its food is perpetual, and its shade also: this shall be the reward of those who fear God; but the reward of the infidel shall be hell-fire."¹⁴ And again: "Those who fear God shall dwell in gardens amidst fountains."¹⁵ "God will introduce those who shall believe, and act righteously, into gardens through which rivers flow."¹⁶

This same conception of the fitting place for the good and for the wicked after death was taught by Zoroaster to the Persians more than a thousand years before the Koran was written. In Max Müller's translation of the "Sacred Books of the East" is given Zoroaster's picture of the abode of the wicked after death:¹⁷ "If a person sins, his dwelling place shall be the place on this earth wherein is least water and fewest plants; whereof the ground is cleanest and driest and least passed through by flocks and herds." Plainly, this is a pastoral people's conception.

RAIN AND RESURRECTION

Even the Mohammedan's belief in the resurrection of the dead seems to be based upon what he saw about him in his arid environment. He saw the annual death of the sparse vegetation, but later saw this spring into life when the rain came. Mohammed writes: "God sendeth down water from heaven and causeth the earth to revive after it hath been dead. Verily herein is a sign of the resurrection unto people who harken." "Consider therefore the traces of God's mercy; how he quickeneth the earth, after its state of death; verily the same will raise the dead; for he is almighty."¹⁸ "One sign of the resurrection unto them is the dead earth we quicken the same by the rain, and produce thereout various sort of grain, of which they eat."¹⁹

¹⁴ Koran, Ch. 13.

¹⁵ *Ibid.*, Ch. 15.

¹⁶ *Ibid.*, Ch. 20.

¹⁷ F. Max Müller: *The Sacred Books of the East*, London, 1879-1895, Vol. 4, p. 3.

¹⁸ Koran, Ch. 16.

¹⁹ *Ibid.*, Ch. 30.

²⁰ *Ibid.*, Ch. 36.

THE WALLED CITY

To the ancient Hebrew of Palestine, living in an agricultural and pastoral land surrounded by marauding desert tribes and always open to raids, a walled city seems to have been the symbol of safety, a place to which one might flee and find peace and security. Through the association of ideas the Hebrew writers made heaven a walled city with gates of pearl and streets of gold. Such a conception would not occur to people whose warring life and whose environment did not make the walled city a place of security, refuge, and desire.

Whether a people conceive of heaven as a place of eternal rest, or as a garden with shade and flowing water, or as a happy hunting ground, or a walled city, or as a great hall like the Norse Valhalla, where those who die in battle continue to fight for Odin, will naturally depend upon what that particular people regards as the acme of happiness; and this in turn will depend upon the special kinds of discomfort, privation, unhappiness, want, and suffering to which that people is subjected—in short the adverse elements in its environment.

METAPHORS DRAWN FROM ENVIRONMENT

Religious teachings and doctrines are commonly metaphorical in phraseology. This being the case the metaphors must be drawn from the peoples' environment if they are to be effective.²¹ The Founder of Christianity said, "I am the vine; ye are the branches." He probably would not have chosen that phraseology in England or Norway. Referring to his followers he said, "Feed my lambs," "The sheep shall be separated from the goats," "I am the good shepherd and know my sheep," "The shepherd giveth his life for his sheep," "I will send you forth as sheep in the midst of wolves," and scores of similar expressions. It is said that when the missionaries in Greenland sought to present these passages to the Eskimo they found it necessary to change "sheep" and "lambs" to "seals" and "little seals"; otherwise the figure meant nothing to him. The repeated references of our Bible to the vine, the fig, the olive, the sheep, and the goats, are clearly a response to the environment and mode of life characteristic of Palestine and regions like it. Had the Founder of Christianity lived elsewhere, the parables and the metaphors which he used must have been differently chosen to be made impressive.²²

NORSE MYTHOLOGY

Among all of the Teutonic and Celtic peoples trees and groves played a part in religious ideas. According to the ancient Norse mythology the

²¹ "In all the phrases which describe India the local coloring arising from the climate of northern India may be plainly discerned." (Cox: *op. cit.*, p. 161.)

²² "The character of mythical speech must necessarily be modified and its very phrases suggested by the outward features and phenomena of the country. . . . The speech of the tropics . . . would tell rather of splendor than of gloom. . . . But in the frost-bound regions of the North, the speech of the people would with a peculiar intensity of feeling, dwell on the tragedy of nature." (*Ibid.*, p. 37.)

original man and woman were created from an ash and an elm tree, and Odin's mighty ash, Yggdrasill, supported the universe. Such conceptions were as consistent in the forest lands of northern Europe as was the worship of the Nile in Egypt or of the sun in Peru.

The Norse mythology is notably influenced by the geographical environment, especially the cold climate, wind-swept mountains, and fiorded coast. In warm and sunny Greece mountains were conceived of as a place of delight, fit for gods to dwell in, especially Mt. Olympus and Mt. Ida. In the teachings of Zoroaster also the gods dwell on mountain tops. But these were not the snow-capped, storm-swept, forbidding mountains of Scandinavia. In cold Norway the mountains were regarded as a race of hated giants against whom the gods continually fought; the blows of Thor's hammer, as he smote the giants, made the thunder. Odin's eight-footed horse was the wind from the four cardinal and four semi-cardinal points. Baldur, the best-loved of Odin's sons, was the summer sun that ruled for a short season, only to be slain each winter. Njord was ruler of the ocean winds and restrainer of the sea's fury; while Frey, the son of Njord, presided over rain and sunshine and was the giver of the harvest. Each of the three great Norse festivals was related to the change of the seasons. As Anderson repeatedly points out, the early Norse religion was emphatically a product of the Norseman's land and climate. Although not a geographer and so not viewing things with a geographic eye, he yet holds that all mythology is the impersonation of nature's forces and phenomena. He says: "Not only the mythology considered as a whole, but even the character of its speech and its very words and phrases must necessarily be suggested and modified by the external features of the country."²³ "The harsh climate of the North modified not only the Norse mythology, but also molded indefinitely the national character, and then the two, the mythology and the national character, acted and re-acted upon each other." "Beholding in external nature and in his mythology the struggle of conflicting forces he naturally looked on life as a field for warfare. The ice-bound fjord and desolate fells, the mournful wail of the waving pine-branches, the strife of frost and fire, the annual death of the shortlived summer, made the Norseman somber, if not gloomy in his thoughts, and inured him to the rugged independence of the country. The sternness of the land in which he lived was reflected in his character; the latter was in turn reflected in the tales which he told of his gods and heroes, and thus the Norseman and his mythology mutually influenced each other."²⁴

CHANGING GODS WITH CLIMATE

Another land in which the climate has features that powerfully influence the life and prosperity of the people is India, with its recurring wet and dry monsoons. If the summer monsoon brought ample rain, crops were

²³ R. B. Anderson: *op. cit.* in footnote 9, p. 59.

²⁴ *Ibid.*, p. 127.

abundant, the people were fed, and a degree of comfort prevailed; but if the rains failed, millions of people were hungry and thousands starved. A phenomenon which so controlled the welfare of the people could scarcely escape incorporation into their religion. The influence of this monsoon climate in modifying the religion which the Aryan invaders of India brought with them is most interesting. These invaders came from the arid plateaus northwest of India and entered, as all its invaders by land have entered, at the northwest. The hymns of the Rigveda throw a flood of light upon the character of these ancient Aryans. They were pastoral people and came from a region of little and uncertain rain. In India they became an agricultural people whose harvests were vitally dependent upon a regular recurrence of rain. The change in their environment and mode of life is reflected in their change of religion. When they entered India, their chief deity was Dyaus (Sky); Indra, his son, the rain-giving deity, was of minor rank. As time went on a change took place; gradually Dyaus shrank to a secondary deity, and Indra, the rain-giver, rose to the place of supreme reverence. In his "Outlines of Primitive Belief," Keary says that among the most genuine hymns of the Rigveda about 265 are addressed to Indra, 233 to Agni (Fire), and not over fifty or sixty to Dyaus or some other god.

Here is an example of the displacement of a supreme deity by a subordinate one in response to a change in geographic environment. Indra became the most revered god of the Aryans because, according to their belief, he gave them the essential thing in their existence—rain. Murray says: "In a land with the climatic conditions of India and among agricultural people, it was but natural that the god whose fertilizing showers brought the corn and vine to maturity should be regarded as the greatest of all."²⁵ A further confirmation is given by Hopkins: "It is impossible for any sober scholar to read the Rigveda and believe that the Vedic poets are not worshiping natural phenomena, or that the phenomena so worshiped were not the original forms of these gods."²⁶ He believes that climatic environment conditioned the evolution of Hindu theology.

FAITH AND PHENOMENA

Keary is authority for the statement that the specialists in every field, Vedic, Persian, Greek, Roman, Teutonic, and Celtic, believe themselves to have discovered that the religious creeds of all these peoples go back to the worship of the phenomena and objects of their natural environment.²⁷ He goes so far as to declare that never in early times shall we find a god unlinked to external phenomena. "Wherever we turn," says Brinton,²⁸ "in time or in space to the earliest and simplest religions of the world, we find them

²⁵ A. S. Murray: *Manual of Mythology*, London, 1873, p. 330.

²⁶ E. W. Hopkins: *The Religions of India* (Handbooks on the History of Religions, edit. by M. Jastrow), Boston, 1895, p. 10.

²⁷ C. F. Keary: *Outlines of Primitive Belief*, New York, 1912, p. 10.

²⁸ D. G. Brinton: *Religions of Primitive Peoples*, New York, 1897, p. 9.

dealing with nearly the same objective facts in nearly the same subjective fashion, the differences being due to local and temporal causes." Speaking of the origin of myths, Murray says:²⁹ "It seems probable that the first phenomena that appealed to the mind were those of the change of the weather or seasons, the revolving day and the revolving year. At any rate, the earliest deities, as well as we can trace them, appear to be those who presided over the movements of the celestial sphere." It is common among comparative mythologists to say that the farther back you trace a myth, the more "atmospheric" the gods become.

Cox considers that the Greek and Norse mythologies sprang from the same Aryan sources; that both have grown up chiefly from names which have been grouped around the sun. The Greek mythology grew mainly out of expressions which describe the recurrence of day and night; the Norse mythology out of those which describe the alternation of summer and winter.³⁰ The difference seems entirely logical, for in Greece the change from summer to winter was a moderate one; but in Norway it meant the coming on of the long, dreary, sub-Arctic nights with days that had only a few hours of light.

It is said that in practically all religions of the higher order the chief deity is placed in the sky and presides over the phenomena of the sky. "Dyaus, Zeus, Divus, Theos, Deus, Juno, Diana, Dianus, or Janus, with many others, are outgrowths from the same root *dyu*, 'to shine.' "

CONCLUSION

In concluding his "Outlines of Primitive Belief," Keary says: "The foregoing chapters must have made it plain that the creed of a people is always greatly dependent upon their position on this earth, upon the scenery amid which their life is passed and the natural phenomena to which they become habituated; that the religion of men who live in woods will not be the same as that of the dwellers in wide, open plains; nor the creed of those who live under an inclement sky, the sport of storms and floods, the same as the religion of men who pass their lives in sunshine and calm air."³¹

It has been the aim of this paper to point out one of the significant influences which give shape to a people's religious beliefs, namely, the influence of geographical environment, and to suggest how logical it is that the religion of the Arab, of the Hindu, of the Egyptian, or of the Incas should reflect the dominant features of their environment. The writer is aware that the environment does not make the religion or necessarily even dominate it, but it inevitably modifies it. "There are," says Fewkes "certain common components of all cults which are as widely spread as the races of man and exist independently of all surroundings, while there are others which are profoundly affected by environment."³²

²⁹ Murray: *op. cit.*, p. 8.

³⁰ Cox: *op. cit.*, pp. 30, 31, 37, 38.

³¹ Keary: *op. cit.*, p. 325.

³² Fewkes: *op. cit.* in footnote 13, p. 684.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Monthly Meeting of February; Meetings of March. A monthly meeting of the American Geographical Society was held on Tuesday evening, February 26, at the Engineering Society's Building, 29 West Thirty-ninth Street. President Greenough presided. He submitted for confirmation the names of 216 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society. Thereupon Dr. Henry Goddard Leach, Secretary of the American-Scandinavian Foundation, addressed the Society on "The Voyages of the Vikings." The lecture, which was illustrated, discussed the colonization of Iceland and Greenland by the old Norse voyagers and their discovery of America.

At an intermonthly meeting on March 12, at which President Greenough presided, Mr. Roy C. Andrews of the American Museum of Natural History addressed the Society on "Explorations in Western China." The lecture dealt with the zoölogical expedition undertaken under the auspices of the Museum in 1916-17 in the province of Yünnan. The explorations covered some little-traveled country in the western part of the province, the route making two loops from Talifu, one to the north and one to the south, and attaining the Mekong valley. Among the lantern slides in natural color (by the Paget process) illustrating the lecture were several remarkable views of this valley, one of the profound trenches characteristic of this region of intense folding, where the mountain systems of Central Asia in their deflection from an east-west to a southerly trend are constricted to a width of barely five hundred miles.

A monthly meeting was held on Tuesday evening, March 26. President Greenough presided. He submitted the names of 202 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society. Thereupon Mr. Edmund Heller, formerly of the Smithsonian Institution, addressed the Society on "The Geographical Barriers to the Distribution of Big Game Animals in Africa." The lecture dealt with the physical geography of eastern equatorial Africa in its relation to the ranges of big-game animals. The lecturer drew upon the experiences of his two expeditions to the region, the Smithsonian African Expedition under the direction of Colonel Roosevelt in 1909-10 and the Rainey African Expedition in 1911-12. The results of the former are laid down in a work, written jointly by Colonel Roosevelt and the lecturer, entitled "Life-Histories of African Game Animals" (2 vols., New York, 1914; accompanied by numerous zoögeographic maps), which was extensively reviewed in the *Bulletin of the American Geographical Society*, Vol. 47, 1915, pp. 190-192. Among effective barriers to animal distribution were mentioned such rivers as the Bahr el Djebel (upper Nile) and the Tana, because of the presence of crocodiles, and the Eastern Rift Valley, the structural depression containing Lakes Guaso Nyiro, Rudolf, and Stephanie.

NORTH AMERICA

A New Standard Rainfall Map of the United States. What will, for many years to come, be the standard map of mean annual precipitation for the United States has recently been published. It is an "advance sheet" (January, 1917) from the forthcoming "Atlas of American Agriculture" under preparation by the U. S. Department of Agriculture. It embodies the best and the latest information available. It recognizes the absolutely essential importance of using only records covering a uniform period, or reduced to a uniform period. In the location of the isohyetal lines it takes reasonable account of topography and of other conditions which indicate, or which control, the amount of precipitation. It is printed in eight shades of blue (under 10 inches; 10-15 inches; 15-20 inches; 20-30 inches; 30-40 inches; 40-50 inches; 50-60 inches; over 60 inches). The isohyetal lines are drawn for every 5 inches, on a base map on the scale of 1:8,000,000 showing the topography (by hachures) clearly and in ample detail, with the names of all the more important mountain ranges and individual mountains given. The new map is not only in itself interesting and pleasing cartographically, but it brings out many details of rainfall distribution which make its close study well worth while.

The records of about 1600 stations for the 20-year period 1895-1914 have been used, together with 2,000 additional records from 5 to 19 years in length. The latter series, it is most satisfactory to note, have been "uniformly adjusted to the same period," i. e.

they have been reduced to the same uniform period of 20 years. This reduction, which is inevitably a very laborious piece of work, the large number of stations employed, and the use of records through the year 1914, combined, make the new map by far the most accurate one available for the United States. Careful distinction is made, by symbols, between the different classes of stations. A small inset map, 1:34,000,000, shows the percentage of annual precipitation occurring between April 1 and September 30 (five shades of color) and was compiled from the records of about 1,600 stations, 1895-1914. An inset diagram shows the period of the year within which 50 per cent of the annual precipitation occurs in twelve districts.

The text which is to accompany the map has not yet been published. However, the principles which were followed in drawing the map are laid down in a recent paper by W. G. Reed and J. B. Kincer (*The Preparation of Precipitation Charts, Monthly Weather Rev.*, May, 1917, pp. 233-235). These had for their aim the uniform adjustment of the available records to the same period, on the one hand, and, on the other, a critical compromise between the method relying on existing rain-gage records alone and that employing reasonable generalization on the basis of known facts of topography, run-off, stream-flow, and vegetation, where precipitation data are lacking. An interesting symposium of the various opinions on this subject was published in the *Monthly Weather Review* some fifteen years ago (Vol. 30, 1902, pp. 205-243).

The new map is made the basis for a general discussion of the rainfall of the United States by the undersigned (*Monthly Weather Rev.*, July, 1917, pp. 338-345; see also his "Rainfall Types of the United States," *Geogr. Rev.*, Vol. 4, 1917, pp. 131-144). A discussion of the essential facts of rainfall in the United States and their representation will be found in Mark Jefferson: *Aridity and Humidity Maps of the United States, Geogr. Rev.*, Vol. 1, 1916, pp. 203-208.

R. DEC. WARD

A Non-Glacial Explanation of the Former Drainage of the Great Basin Area. Lately observation in the Great Basin calls into question the alleged dominant influence of a glacial climate in the production of the former large desert lakes, Bonneville and Lahontan. A simpler and more satisfactory explanation is found without recourse to climatic conditions so very different from those now existing in the region.

Ample evidence is forthcoming indicating that prior to the beginning of the Glacial Epoch two majestic rivers traversed this arid tract and flowed through to the sea. Part of the headwaters of the old river which occupied the long Bonneville basin are the headwaters of the present Snake River of Idaho. Professor W. W. Atwood has recently shown (*The Physiographic Conditions at Butte, Montana, and Bingham Canyon, Utah, When the Copper Ores in These Districts Were Enriched, Econ. Geol.*, Vol. 11, 1916, pp. 697-740) that just previous to the Glacial Epoch the basin of the Snake River extended nearly 200 miles farther to the northeastward than it now does. The continental divide then shifted 150 miles to the westward. An area nearly 300 miles square belonged to it that no longer does. This vast tract was mainly that part of the basin of the present Missouri River lying above the Great Falls. Passing Idaho Falls and Pocatello was a combined volume of waters of the present Snake River and of the Missouri River at the Great Falls gorge. This noble stream is thought to be the Old Virgen River, the superior companion of the Green River, that traversed the entire length of the Bonneville valley and fell into the Colorado River at the Big Bend in Arizona. By orographic damming of its course through the rapidly rising Colorado dome the waters of this old drainage way spread out far and wide over the illimitable desert plains. With the diversion of its headwaters the Old Virgen River could no longer furnish the chief supplies to Lake Bonneville, and the latter's waters evaporated until only a last vestige remained in the present expanse which we denominate Great Salt Lake.

In the recent migration of the continental divide in Montana the Yellowstone River took part of the Old Snake or Virgen headwater drainage, the Missouri River the greater portion, the Clark Fork of the Columbia River a third share, and the Salmon Fork a part. Deprived of its headwaters and blocked by basalt flows at Pocatello, the remnantal pre-glacial stream was turned out over the Idaho lava fields as the diminutive riverlet that we find today as Snake River.

In a somewhat earlier effort (*U. S. Geol. Survey Prof. Paper No. 61, 1909*) Professor Atwood maps the areas once occupied by glaciers on the Wasatch and Uinta Mountains. The surprising result of this quantitative measurement is the utter insignificance of these mountain ice tongues. Neither as a direct cause, nor as an associated cause, of change in climate do they indicate that they were ever competent to effect noteworthy differences in the climatic conditions now existing.

So the former existence of great expanses of waters in the desert not only do not necessarily portend notably moister climate than that which prevails at the present day, but it finds adequate explanation in the varied vicissitudes of normal river system

development. To this remarkable reversal of drainage and this still more remarkable shifting of the continental divide are ascribable all of those geographic changes which have made of Butte the greatest mining center of the world. CHARLES KEYES

Supplying the Canal Zone with Central and South American Products. The Panama Canal Commissary, in order not to draw upon food supplies of the United States for the support of the Canal Zone population, has established a considerable trade with nearby markets in Central and South America and in the West Indies (*Panama Canal Record*, Feb. 6, 1918, pp. 273-274). The provisions handled by the Zone authorities for the canal workers were formerly brought largely from this country, while the rich tropical lands of neighboring districts were drawn upon for little but the most perishable goods. Haiti and Costa Rica now supply most of the fresh fruit and vegetables. Coffee comes from these two countries and from Colombia. The latter also furnishes cattle, hogs, and poultry. Sugar is imported from Nicaragua and Colombia. Beans of several kinds are supplied by the west coast countries of South America, Haiti, and Costa Rica. Besides accomplishing its purpose of helping to relieve the food situation in North America, this plan will possibly lay the foundation for permanent trade relations with the districts near the isthmus and so foster the agricultural development of those regions, one of whose difficulties has always been the lack of convenient markets for their produce. Though the population of the Canal Zone will not be large, since most of the strip is being depopulated, yet, combined with the constantly increasing business of furnishing supplies for the steamers that use the canal, the trade should assist in making the Panama cities active commercial centers.

SOUTH AMERICA

South American Boundary Disputes, Settled and Unsettled. By treaty of July 15, 1916, Colombia and Ecuador came to agreement over their common frontier. The frontier thus defined terminates on the Pacific Coast along the Mataje River, south of the Mira, thus giving all the Mira delta to Colombia. East of the Andes Colombia is awarded the greater part of the basin of the Putumayo, the boundary running for the greater distance along the watershed between the rivers Putumayo and Napo. The eastern half of this region is, however, still in dispute with Peru. On the inset map accompanying Hermessen's article on the Rio Zamora (*Geogr. Rev.*, Vol. 4, 1917, p. 436) the new frontier is shown as far as its meeting with the line of the Peruvian-Ecuadorian frontier as shown on Pl. 212-213 of Andree's "Handatlas," 6th edition, Leipzig, 1914. Thence it runs along the Ambiyacú River to the Amazon. The text of the treaty is given in the *Revista de Geografía Colonial y Mercantil* (published by the Royal Geographical Society of Madrid), Vol. 14, 1917, No. 5-6, pp. 179-180.

The boundary between Ecuador and Peru constitutes one of the major South American frontiers still unsettled. Local interest in it has lately been revived through the railroad plans now under consideration by the governments of the respective countries. Peru is contemplating a line from Paita, her chief northern port, to the navigable waters of the Marañón, whereby the Amazonian port of Iquitos would be put into communication with the Pacific. Ecuador has three railroad projects which would materially aid her in making good her claims to the debated territory. One is completion of the Ambato-Curaray line, a line to the eastern lowlands; rails have been laid for 20 kilometers. A second is completion of the line from Puerto Bolívar, on the Gulf of Guayaquil near Machala, to the plateau town of Cuenca and thence extension to Loja near the present frontier. The third line contemplated, from Sibambe to Cuenca, would connect the proposed Loja line with the existing Guayaquil-Quito line (*The Northern Frontiers: A Railway Struggle*, with map, *West Coast Leader* (Lima, Peru), November 3, 1917; republished under the title of "A Long-standing Controversy," with new illustrations and map, in *The South American* (New York), January, 1918).

Of a more unique character is the dispute between Argentina and Uruguay (Argentina and Uruguay Boundary Dispute, *The South American*, January, 1918, from the *River Plate Observer*). When Uruguay was created by agreement between Argentina and Brazil in 1828 the southern boundary of the new republic was defined as the coast of the Río de la Plata. Uruguay therefore has no legal control over the La Plata waters. In time of peace navigation on these waters is free to all nations, but Argentina reserves the right to close the river in case of war. Uruguay, seeking a more reassuring status, claims a right to one-half the river. Argentina objects in part on the grounds that the safeguarding of the great highway that leads into the heart of the continent cannot be entrusted to a small nation; in part because under the peculiar hydrography in question an adjudication according to international practice would prove unfavorable to her. The current of the La Plata swings towards the Uruguayan coast, where is to be found the

channel navigable for large craft. A division of the river in the middle would completely shut off Argentina from deep water. A division along the natural *talweg* would give the island of Martin Garcia, the military key to the upper rivers, to Uruguay.

EUROPE

The Geographical Basis of Alsace-Lorraine's Attachment to France. In a recently published work (*La France de l'Est: Lorraine-Alsace*, 280 pp., 2 maps, Colin, Paris, 1917) the dean of French geographers, Professor Vidal de la Blache of the Sorbonne, gives an admirable account of the geographical basis of the development of Alsace-Lorraine—the "France of the East." So, says the author, may be generically termed the region between the Rhine, the Meuse, and the Ardennes. What are the bases for it?

In history Alsace and Lorraine have repeatedly figured as frontier countries. It was inevitable, for they lie between peninsular Western Europe and Central Europe of the illimitable hinterland. Yet more than a frontier, this region—to consider the two countries together—anciently has figured as a connecting link, a passageway or rather as a place of crossroads. By the Alsatian Rhine the Danubian ways are linked with northern Germany. By the Moselle and the Toul Gap influences from the Paris Basin penetrate eastward. The Gap of Belfort and the Saône respectively connect Alsace and Lorraine with the Rhone and the Mediterranean. This very fact carries the suggestion that the region is not suitably built for political autonomy. Detailed examination of the structure confirms the conclusion. Holland, a small country, finds the basis of her political autonomy in the wide sea; Switzerland in her mountains. In Alsace-Lorraine is no physical feature making for such unity. Lorraine, geologically a dependence of the Paris Basin, with characteristic concentric zones here presenting great lithological variations in narrow space, is distinguished by marked "infirmity" of structure. Until the industrial penetration of the Vosges in recent times the sole link between Lorraine and Alsace was by the Col of Zabern: the countries turned their backs on one another. Even the Alsatian Plain between the two natural barriers of the Vosges and the Rhine—for the Rhine downstream to Strassburg has been a partier rather than a uniter of men—shows variations of soil and water conditions that have involved important modifications in human occupation. Where, then, belongs Alsace-Lorraine, torn between east and west? Certain arguments, ethnographic, linguistic, appropriate to the consideration of regions of less high development do not avail here. In human geography is found the justification of "France de l'Est," as unfolded in the region's development during the last two or three centuries, that is in modern times.

When the Peace of Westphalia (1648) gave France effectual sovereignty over these lands of her eastern border she found herself in control of a land-loving people of sturdy independence and real personality. Love of the soil was fundamental. In both Alsace with its naturally rich and varied resources and Lorraine with its more niggardly yet workable soil agriculture had reached a high degree of development. And love of the land was reinforced by democratic tendencies unusual for the time—themselves a heritage of the frontier. Here surely was need for delicate handling, and the need was recognized. France already showed signs of the assimilative power that was subsequently to make her great among colonizing nations. By slow degrees and natural channels only did the wise government of the Old Régime seek to bind the new territories. Language, religion, economic systems and privileges were respected. But one new element failed not to make an impression—French justice, "*justice égale*." Thus, through a century and a half, was prepared the way for the event through which Alsace and Lorraine entered completely into French unity—the Revolution. And the Revolution that bound Alsace and Lorraine to France also emphasized their severance from Central Europe. When they saw the petty princelings and their feudal following take the road of Germany, Alsace-Lorraine bade lasting farewell to spiritual domination from the region beyond the Rhine.

Nowhere did the Revolution find greater response than among the people of the East. It touched them in their most sensitive fiber, in their attachment to the soil. Its effects on the division of the land, the progress of agriculture, and the growth of the rural population are here seen at a maximum. Even during the wars of the Revolution and the Empire population exhibited no diminution, and with the establishment of peace in 1821 growth proceeded by leaps. Concomitant with it was a progress in industry which until the middle of the century was in close alliance with the agricultural advance. The divorce between agriculture and industry is first shown in the census figures for 1856. The ancient metallurgical industries of the Moselle, the long-established cotton industry of Mülhausen and the Vosgian valleys then began to enter on the modern industrial epoch. Highways of communication, canals and railroads, were built uniting Alsace and Lorraine.

with each other and with the rest of France and with the Rhine. In the new economic adjustment of human relations, close organization and increased intercommunications, the two divisions for the first time in history formed a real unit.

This point needs emphasis: alone it makes clear the depth of injury wrought in 1871 by which the carefully built economic unity was destroyed. Yet the consequences were not entirely such as might have been anticipated. The remnant of eastern France left with but the crumbs of the metallurgical industries of Lorraine, with the weavers of the Vosges cut off from the Alsatian spinners, was not prostrated. Actually she gained by the misfortune of the lost provinces. A map of the gain and loss of population by canton in the frontier region since 1871 brings out a notable feature of this profit. The cantons of the western flank of the Vosges *en échelon* with Belfort have all gained in population, while those of the eastern flank have lost. Not individuals or families but whole groups of peoples removed themselves from Alsace and Lorraine to the departments immediately across the frontier, where, despite differences of dialect and customs, they found harmony of spirit. Probably it is no exaggeration to say that the exodus has accounted for 500,000 people, one-third of the population of 1866. Not for a quarter of a century, by aid of Prussian immigration and a mob of Italian and Polish laborers, was the deficit made up.

Perhaps the most remarkable feature of the mutilation was the impetus given to the iron-industry in French Lorraine. By discovery of the continuity of the ore deposits to the west, especially those of the Briey basin, and by admirable industrial organization France has here built up again an economic unit, curtailed though it may be by the political frontier across which mingle the smokes of the French and German foundries. And here appears a point of special interest. In this frontier region is mirrored the opposition of French and German aims; the French ideal of regional, and thus individual, development and the German ideal of hegemony. A comparison of population statistics for the cities of Metz and Nancy is instructive:

	1866	1872	1881	1891	1901	1911
Nancy	49,993	52,978	73,225	87,110	102,559	119,949
			1880	1890	1900	1910
Metz	54,817	51,332	53,171	60,186	58,462	68,598

It should further be borne in mind that a quarter of the population of Metz is military and official. In its geographical situation and its traditions Metz is eminently fitted to be a regional capital. Since 1871 the heavy hand of the German economist, subordinating Lorraine to the Westphalian coalfield, has stifled regional growth.

Strassburg alone of the large cities of Alsace-Lorraine shows a phenomenal growth since 1871, and this is dependent on the extraordinary development of the Rhine: it is another testimony to the ideal of German hegemony. The late improvement of the Rhine as a navigable waterway is the first stage in the development of a Central European route destined to be the master route of the continent. Enlightened nations have come to recognize the principle of free access for all to the great rivers and seas. German hegemony is subversive of this principle, which has so important a bearing on the great Rhine route. Before the war foreign flags already suffered serious handicap on the Rhine. By the restoration of France to the river the principle of free navigation would be safeguarded. Not only the complete development of France but also the harmony of world relations demand the re-establishment of France de l'Est.

ASIA

Japan's Growing Merchant Marine. According to the *Yokohama Chamber of Commerce Journal* for November, 1917 (p. 3), Japan will soon be building ships at the rate of 250 per year. This means an annual addition to her merchant marine of about 1,000,000 tons. Forty-two companies are engaged in the industry, with 113 slips already established and 24 more in course of construction. No figures are given as to the number of people employed, but an undertaking such as this must offer work for many thousands.

As an island people, with a dense population but a limited area for production, Japan, when she took her place among Western nations, recognized that hers would be the role of a maritime power. To maintain her economic independence she must have her own ships. Successful territorial or commercial expansion requires that maritime development keep pace with the acquisition of outlying possessions or foreign markets. The nation must keep in touch, too, with the many settlements which her over-populated islands send out into other lands.

Japan is favorably situated as a center of distribution in the Orient, but, otherwise,

her location far from the leading commercial countries, with the vast undeveloped Asiatic continent or the wide expanse of the Pacific interposed between her and the world's most active trade centers, means long journeys for her merchantmen and much time consumed in each voyage and, consequently, demands many ships for the traffic with Western nations.

A glance at the distribution of Japan's foreign trade reveals her need for a large merchant fleet. According to *Commerce Reports Supplement No. 55c* for December 31, 1917, the value of imports into Japan during 1916 was, in round numbers, \$377,000,000 and that of exports was \$562,000,000, giving a total foreign trade of nearly a billion dollars. (For the effect of the war on Japanese trade see the note in the January, 1918, *Review*, p. 77: Japan, the Commercial Focus of the Pacific.) A large part of this trade was with China, but much of it was carried on with countries far distant. For example, \$40,000,000 worth of cotton and about \$20,000,000 worth of iron manufactures had to be carried from the United States. Cotton valued at \$4,000,000 was imported from Egypt. Dynamite worth nearly \$1,000,000 came from Canada, England, and the United States. Peru, Sweden, Chile, France, and Italy figured also among the countries from which Japan imported. The distribution of exports, too, shows how far her merchants must fare in search of markets. Raw silk worth \$112,000,000 was sent to the United States. The same material worth \$16,000,000 went to France. The United Kingdom bought from Japan large shipments of peas, braids, copper ingots and slabs, husked rice, silk habutai, cotton underwear, etc. Japanese exports were in demand, also, in considerable quantities in Australia, British India, South Africa, Egypt, Italy, Denmark, Hawaii, Argentina, Norway, and Chile. Furthermore, Japan is becoming an important center of redistribution. Sugar from the Philippines and the Dutch East Indies was reshipped to China. Cotton from India, the United States, China, and Egypt was manufactured and exported to China, Australia, the Philippines, Cape Colony, Asiatic Russia, the United Kingdom, and many other countries. Clothing made from Australian wool was reshipped to China, India, France, England, and Russia.

The present employment of many ships for transporting troops, considerable losses to Allied tonnage, and the continued absence of German shipping from the seas offer Japan an unparalleled opportunity to build up a great merchant marine that will soon make her, in maritime commerce at least, the England of the Pacific.

MATHEMATICAL GEOGRAPHY

British Versus Metric Measures in Geographical Work. Is it desirable for the British Empire to adopt the metric system of weights and measures? To this question at the time under the consideration of the conjoint Board of Scientific Societies a geographical contribution was made by Arthur R. Hinks in a paper read before the Royal Geographical Society (British and Metric Measures in Geographical Work: Notes for Discussion, *Geogr. Journ.*, March, 1917). Naturally the geographer is most concerned with lineal measurements, in regard of which Mr. Hinks makes propositions summarized thus:

"All British maps should be provided with scales of horizontal distances both in miles and kilometers; heights and contours should as far as possible be in meters, both on land and in the sea. The representative fractions of all British maps should as far as possible be in round numbers.

"In work relating to countries which use the metric system and in statistics, results should be given in British and metric, or in metric alone, but not in British alone. The more technical the work, the more desirable is the use of the metric units. In British geodesy the metric system exclusively should be used for the future."

Emphasis is laid upon the need of a single standard for purposes of geodesy, where the greatest precision is demanded in regional comparisons, and for the construction of contoured maps, where transformation to the British unit cannot be made with exactitude, a fact clearly brought out in the work that has been done on the 1:1,000,000 map of Europe and the Near East which, compiled under the direction of the British General Staff, is being published by the Royal Geographical Society (see *Bull. Amer. Geogr. Soc.* Vol. 47, 1915, pp. 776-777).

A New Chart for the Barometric Determination of Altitudes. The difficulties in connection with the accurate determination of altitudes by means of barometers are well known. There are the questions of transporting mercurial barometers; the errors of aneroids; the need of simultaneous observations of temperature and pressure at the upper elevation and at a lower station whose altitude is known; the effects of temperature, water vapor, latitude, etc. The allowance which must be made for varying temperatures is the most important.

In order to facilitate a quick and accurate determination of altitude, the pressure and the temperature being known, Professor Alexander McAdie of Blue Hill Observatory near Boston, Mass., has designed a neat and convenient chart. This is primarily intended for the use of aviators. It permits the rapid estimation of the altitude, taking account of necessary correction for the mean temperature of the air column. The chart is about $13\frac{1}{2}$ by 8 inches in size. Four different temperature scales are given (at the left of the card), Fahrenheit, Centigrade, Absolute, and New (see *Geogr. Rev.*, Vol. 4, 1917, p. 215, Fig. 1). The range is from $+90^{\circ}$ to -22° Fahrenheit. Across the top of the sheet are the pressure scales (inches, millimeters, and kilobars), ranging from 30.00 inches at the left to 21.20 inches at the right. At the bottom are two altitude scales, in feet and meters. The range is from sea-level to 9,000 feet. The method of using this card is as follows: A rubber band is placed around the cardboard from left to right and is adjusted to the observed temperature. A second rubber band is placed around the cardboard from top to bottom in such a way that it runs from the observed pressure reading parallel to the nearest of several slanting broken lines. From the point of intersection of the two rubber bands, the vertical co-ordinate is followed to the bottom of the diagram, where the altitude, corrected for temperature, is read off. On the reverse of the chart there is a brief statement concerning the barometric determination of altitudes and an explanation of the use of the chart.

R. DEC. WARD

PHYSICAL GEOGRAPHY

The Work of the Wind in Warming a Lake. The work of the wind is largely responsible for the annual warming of lakes below a depth of two or three meters, beyond which sunlight does not penetrate appreciably. Professor E. A. Birge has made a careful study of the amount of work required to give the observed temperatures of the different layers (*Trans. Wisconsin Acad. of Sci., Arts, and Letters*, Vol. 18, Pt. 2, August, 1916, pp. 341-391). The sun and wind effects are constantly in a conflict in which the former is uppermost in summer, but the latter in autumn. The more the sun warms the surface layers of a lake, the more difficult it is for the wind to produce currents of warm water downward against gravity. This is particularly the case for shallow or small lakes. For example, compare Lake Geneva with Green Lake, both in Wisconsin. They have about the same surface area and about the same summer heat income, 27,000 calories per square centimeter in 1913; but Lake Geneva at a depth of 20 meters has an area only 51 per cent of the surface while Green Lake has a corresponding 61 per cent. The 3,690 calories per square centimeter distributed in Lake Geneva below 20 meters required a minimum of 500.6 gram-centimeters of work, whereas Green Lake had 5,450 calories distributed at a cost of at least 476.5 gram-centimeters. This difference is due to the greater warming of the upper layers of the shallow lake, which makes the thermocline (at 7 to 11 meters) steeper, and so more resistant to down-currents, than that in a deep lake. The stronger the wind, the greater the resistance to a downward current becomes, for, as the warm water is piled up on the leeward side of the lake, it is forced down closer to the cold water. Professor Birge has likened the work of the wind on a lake to pressure on a spring: the more it is compressed, the harder it has to be pushed; and when the pressure is released there may be little or no permanent result.

CHARLES F. BROOKS

Showers of Organic Matter. There are many cases on record of the occurrence of showers of organic and inorganic matter. Ancient as well as modern chronicles mention falls of insects, of small animals such as toads, of dust, of seeds, of fish. "Blood rain" has always caused superstitious fear among ignorant people. The whole subject is an interesting one, especially from a meteorological standpoint. The biologist also has a real interest in it because of the possibility of the transportation, in such "showers," of animal or plant life. A discussion of showers of organic matter by Waldo L. McAtee of the U. S. Bureau of Biological Survey brings together a large number of facts and is of more than usual popular interest (*Monthly Weather Rev.*, May, 1917, pp. 217-224). The author deals first with "spurious showers." In this group are included "manna rains." Manna consists of lichens of the genus *Lecanora*. In none of the recorded cases of such "rains" is there any direct evidence that the substance fell from the sky. These lichens, forming small round bodies, are easily blown over the earth's surface, accumulate readily in depressions, and are drifted into masses during the run-off of rain water. Manna "rains" occur only in regions where these lichens are common. "True showers" include red rains (dust) and showers of plants, invertebrates and vertebrates. The most interesting "showers" are those of frogs or toads and of fish. The author gives several historic examples of such occurrences and states that "there cannot be the slightest doubt that there are genuine phenomena of this character, though perhaps

PROFESSOR LOUIS GENTIL of the University of Paris was awarded the Prix Delesse by the Paris Academy of Sciences on December 10, 1917, for his work on the geology and physical geography of northern Africa, particularly Morocco. Professor Gentil's work is summarized in his admirable "Le Maroc physique" (Paris, 1912).

M. HENRI JUMELLE, professor of botany at the University of Marseilles and Director of the Colonial Museum of that city, was awarded the Prix Gay of the Paris Academy of Sciences on December 10, 1917, for his work on the geographical distribution of tropical and sub-tropical plants of economic value.

On DR. J. SCOTT KELTIE, editor of the "Statesman's Year-Book" and for many years Secretary of the Royal Geographical Society of London, was conferred the honor of knighthood on the occasion of the annual distribution of New Year honors in Great Britain.

MR. W. T. LEE of the U. S. Geological Survey read a paper before the Geological Society of Washington on May 9, 1917, entitled "The Geology and Scenery of the Rocky Mountain National Park."

DR. H. H. RUSBY of New York read a paper before the Torrey Botanical Club on February 12 entitled "Botanical Exploration in Colombia."

M. FRANÇOIS SCHRADER, the geographer and cartographer, head of the map department of the publishing firm of Hachette et Cie. of Paris, has been giving a course on "The Geographic Causes of Affinity and Differentiation Among Human Groups; Evolution of the Old World" during the past winter at the Ecole d'Anthropologie de Paris.

DR. AUREL STEIN received an award from the Fondation Tchihatchef at the hands of the Paris Academy of Sciences on December 10, 1917, for the work of his three Central Asian expeditions (1900-01, 1906-08, 1913-16).

DR. STEPHEN S. VISHER of the Department of Geography of the State Normal School at Moorhead, Minnesota, has been appointed a land classifier in the U. S. Geological Survey. The Survey's Land-Classification Board is engaged on the classification of more than 20,000,000 acres of arid land situated in the western part of the United States.

OBITUARY

DR. ROLLIN A. HARRIS, tidal expert of the U. S. Coast and Geodetic Survey, died suddenly on January 20 at the age of 55. His major work is a "Manual of Tides," a monumental treatment of the subject which appeared as Appendices to the *Annual Reports of the U. S. Coast and Geodetic Survey*, as follows: Part I, Introduction and Historical Treatment of the Subject, 150 pp., App. 8, *Rept. for 1897*; Part II, Tidal Observation, Equilibrium Theory, and Harmonic Analysis, 147 pp., App. 9, *Rept. for 1897*; Part III, Some Connections between Harmonic and Nonharmonic Quantities, Including Applications to the Reduction and Prediction of Tides, 137 pp., App. 7, *Rept. for 1894*; Part IVa, Outlines of Tidal Theory, 165 pp., App. 7, *Rept. for 1900*; Part IV B, Cotidal Lines for the World, 85 pp., App. 5, *Rept. for 1904*; Part V, Currents, Shallow water Tides, Meteorological Tides, and Miscellaneous Matters, 315 pp., App. 6, *Rept. for 1907*. For an estimate of Harris' tidal theory as developed in this manual see Krümmel's "Handbuch der Ozeanographie," 2nd edit., Vol. 2, pp. 254-258, 1911, and Poincaré's "Mécanique Céleste." To geographers Dr. Harris was possibly best known for his advocacy, on the basis of tidal observations, of the existence of a land mass north-west of the American Arctic Archipelago ("Arctic Tides," 103 pp., U. S. Coast and Geodetic Survey, Washington, 1916). Nansen has recently taken exception to the arguments on which this view was based ("Spitsbergen Waters," Art. 2 in *Kristiani Videnskapselskabet's Skrifter: Mat. Naturv. Klasse, 1915*; see especially section on "The Extension and Shape of the North Polar Basin," pp. 92-98); and the recent advance into the unknown made by the MacMillan and Stefansson expeditions (see the *Marine Review*, pp. 238-241, with map), the plan of the latter of which was partly based on Harris' theory, would seem to show that at any rate no land exists as near to the known coasts as assumed by him.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

GENERAL

DIXON, R. B. **The early migrations of the Indians of New England and the Maritime Provinces.** 14 pp. Reprinted from *Proc. Amer. Antiquarian Soc.*, April, 1914. Worcester, Mass., 1914.

From a study of languages combined with the scanty records of shell heaps and graves Professor Dixon reads the story of the movements of the aborigines of the Northeast. With one possible exception all belonged to the Algonquin linguistic stock, whereas to the west of the region described, in New York and Ontario, the Iroquois were found. In a study of the archeological evidence a contrast was found between the remains west of the Maine-New Hampshire boundary line and those to the east of it. In the former there appears to have been a greater development of village life and more extensive use of agriculture; in the latter, including the Maritime Provinces of Canada, there is little evidence of a settled village life or of agriculture. On the basis of language a similar division is found. The more eastern of these groups is divided into two: the Micmac and the Abnaki, which were somewhat closely related. To the west two other groups are found: one formed by the Massachusetts tribes as far west as and including the Connecticut Valley, together with the tribes of eastern Connecticut, Rhode Island, and eastern Long Island; the other including the tribes of western Massachusetts and Connecticut and the Hudson Valley southward through New Jersey and Pennsylvania into Delaware. A study of the languages of these tribes shows the closest relationship to have been with the central Algonquins of the Ohio Valley.

Combining this evidence with that afforded by the mythology and culture of these tribes, Professor Dixon arrives at the conclusion that the distribution of tribes in New England was the result of a series of migrations. The latest comers, the Lenape of the Ohio Valley, arrived in southwestern New England at about the end of the fifteenth century, pushing the earlier settlers, also from the Ohio Valley, farther to the east. On the other hand the Micmac and Abnaki of the northeast evidently had a different origin. Just what this was cannot be fully known with the present lack of knowledge concerning the archeology of the middle and lower St. Lawrence Valley. It is thought that the Micmac, with possibly the Abnaki to the east, may have once occupied a large part of the St. Lawrence Valley and from there been driven forward by the encroaching Iroquois. This association accounts for mythological similarities between the Micmac and the Iroquois and for the presence of certain peculiar cultural objects, also for the lack of these in the Abnaki farther east who were not in contact with the Iroquois.

R. H. JONES

— Douglas, David, **Journal kept by, during his travels in North America, 1823-1827, together with a particular description of thirty-three species of American oaks and eighteen species of pinus, with appendices containing a list of the plants introduced by Douglas and an account of his death in 1834.** Published under the direction of the Royal Horticultural Society. 364 pp.; ills., index. William Wesley & Son, London, 1914. £1, 1s. 10 x 6½.

The name of David Douglas is inseparably linked with the botany of the Pacific Northwest. It can safely be said that no botanical explorer has contributed more to our knowledge of the flora of this region than he. Born in 1798 and meeting an untimely end in 1834, the results achieved by this young pioneer during his brief career almost surpass belief. Some idea as to the extent of his work is suggested by the fact that of the plants catalogued in Piper's "Flora of the State of Washington" (*Contr. U. S. Natl. Herbarium*, Vol. 11), over two hundred and fifty species, by rough count, are noted as having been first collected by Douglas. Of these, more than a hundred retain the specific name first applied by him, while upwards of twenty bear the specific name of "Douglasii."

The present volume presents in full the journal kept by Douglas during his travels in North America from 1823 to 1827, together with several other hitherto unpublished manu-

scripts and various facts relating to his life, works, and death. Sent out in the interests of the London Horticultural Society, in 1823 he traveled through parts of New York, New Jersey, and Pennsylvania, but this first journey was not productive of results of any particular scientific value. On a second journey (1824-1827) he explored the larger part of what is now the state of Washington, together with much of Oregon and Idaho. From here he returned to England by way of Hudson Bay, traveling up the Columbia, crossing through Athabasca Pass, and thence down the Saskatchewan to York Factory. It was on this overland trip that, in naming the two mountains which flank Athabasca Pass, Mounts Brown and Hooker, he accredited them with elevations of approximately 17,000 feet (p. 72). This led to their being counted among the highest peaks in North America, a misconception which was only definitely cleared up by A. P. Coleman's expedition in 1893 (*The Canadian Rockies: New and Old Trails*, pp. 206-208). On a third journey (1831-1833) Douglas extended his field of investigations to California, carried out further explorations in the Northwest, and later sailed for the Hawaiian Islands, where he met a tragic death on July 12, 1834.

GEORGE E. NICHOLS

ALMAGIÀ, ROBERTO. *Nuovi studi sui viaggi dei Normanni nell'Atlantico settentrionale e in America*. *Riv. Geogr. Italiana*, Vol. 24, 1917, No. 5, pp. 200-205.

GERMAIN, LOUIS. *L'origine et la distribution géographique des faunes d'eau douce dans l'Amérique du Nord*. *Map. Ann. de Géogr.*, No. 132, Vol. 23-24, 1915, pp. 394-406.

KELLOGG, L. P., edit. *Early narratives of the Northwest, 1634-1699*. xiv and 382 pp.; maps, index. Charles Scribner's Sons, New York, 1917. \$2.50. 9 x 6.

KROEBER, A. L. *The tribes of the Pacific coast of North America*. *Proc. Nineteenth Internatl. Congress of Americanists held at Washington, Dec. 27-31, 1915*, pp. 385-401. [Smithsonian Institution,] Washington, D. C., 1917.

MATHER, K. F. *The Champlain Sea in the Lake Ontario basin*. Maps, ills. *Journ. of Geol.*, Vol. 25, 1917, No. 6, pp. 542-554.

SAPIR, E. *Time perspective in aboriginal American culture: A study in method*. ii and 87 and vii pp. *Geol. Survey of Canada Memoir 90: Anthropol. Ser. No. 13*. Ottawa, 1916. [Geographical distribution of cultures and culture elements is one of the most powerful lines of evidence.]

UNITED STATES

Western States

KENNAN, GEORGE. *The Salton Sea: An account of Harriman's fight with the Colorado River*. 106 pp.; maps, ills. The Macmillan Co., New York, 1917. \$1.00. 8½ x 5½.

The Cahuilla Basin, wrongly called the "Salton Sink" by Mr. Kennan and other writers, is in the form of the bowl of a large spoon, with the tip ending in the delta of the Colorado River, while the handle would be attached to the bowl near San Geronimo Pass. Inveterate optimism in the settlement of the southernmost portion of the basin not adequately provided with irrigation facilities, led to premature demands for water in 1901-1904. Desperate chances were taken with a wayward, silt-laden river flowing through deep alluvium. It must have seemed urgent to the engineers to furnish water to the settlers on the small area of land occupied previous to 1914, but, in view of later happenings, the refusal to do so would have been a justifiable sacrifice. The chief part in the colossal task of bringing the river under control naturally fell to the largest and most powerful organization in the region—the Southern Pacific Railway. Transportation, material, and labor were drawn upon without stint, and undaunted perseverance was displayed in making plans to meet new and unexpected engineering contingencies. The formation of the Salton Sea, with its area of about 450 square miles in one of the most arid regions in America, made a splendid opportunity to study the formation of aquatic conditions in the desert, and the gradual return to arid conditions marked by successive changes in the vegetation (*A Decade of the Salton Sea*, *Geogr. Rev.*, Vol. 3, 1917, pp. 457-473). The series of reorganizations and transfers by which the Southern Pacific acquired control of the land and irrigation company under whose régime the crisis came was so close and complicated that the limit of responsibility is not easily discernible. It is therefore not surprising that members of Congress, unaccustomed to altruism and familiar with the exorbitant demands and obliquity of procedure on the part of claimants, should fail to rise to the occasion and to pass measures to reimburse the Southern Pacific for an expenditure of money and effort in excess of its responsibilities.

D. T. MACDOUGAL

GUINN, J. M. **The passing of the rancho.** *Ann. Publs. Hist. Soc. of Southern California*, Vol. 10, 1915-16, Parts 1-2, pp. 46-53. Los Angeles. [A comment on the decline of the cattle industry in Southern California in relation to the rise in land values and to the years of drought. For nearly half a century the great commercial industry of Southern California had been the raising of cattle, first for their hides and tallow for export and later to supply beef to the miners in the gold fields. The industry required that the land devoted to it be held in large tracts called "ranchos." In the two years, 1863 and 1864, the rainfall was so slight that it was impossible to secure forage afield. It is asserted that a million cattle and horses starved to death. The rancheros were without money with which to restock the ranges or to cultivate them. Thus dawned the day of the small landholder and of rapidly increasing land values. The author describes several large ranchos and the manner in which each was split up into small holdings which could be irrigated for intensive agriculture.]

HICKS, W. B. **Evaporation of brine from Searles Lake, California.** 8 pp.; diags. *U. S. Geol. Survey Professional Paper 98A*. Washington, 1916. [A continuation of the experiments working toward a solution for the economical production of potash salts from the brine of the lake. See "Potash Resources of the United States" in the March, 1916, *Review*, Vol. 1, p. 217.]

JARDINE, J. T., AND L. C. HURTT. **Increased cattle production on Southwestern ranges.** 32 pp.; map, diagr., ills., bibliogr. *U. S. Dept. of Agric. Bull. No. 588* (Contribution from the Forest Service). Washington, D. C., 1917.

KEYES, C. R. **Orographic origin of ancient Lake Bonneville.** *Bull. Geol. Soc. of America*, Vol. 28, 1917, No. 2, pp. 351-374. ["Instead of a genesis due to conditions of moister climate induced by a glacial epoch, the facts gathered seem to point not only to a pre-glacial date of the lake's birth, but to a diastrophic rather than a climatic cause for its existence." See also the note on pp. 326-327, above.]

KROEBER, A. L. **California place names of Indian origin.** *Univ. of California Publs. in Amer. Archaeology and Ethnology*, Vol. 12, 1916, No. 2, pp. 31-69.

LECHNER, H. J. **Some geographic influences of eastern Washington in relation to agriculture.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 9, pp. 362-364.

MCARTHUR, L. A. **Geographical progress in the Pacific Northwest.** *Mazama*, Vol. 5, 1916, No. 1, pp. 94-95.

— **National Parks portfolio.** [Nine pamphlets of views, with four pages of introductory text, as follows:] (1) Yellowstone National Park, 31 views; (2) Yosemite National Park, 28 views; (3) Sequoia National Park, 27 views; (4) Mount Rainier National Park, 24 views; (5) Crater Lake National Park, 2 diags., 23 views; (6) Mesa Verde National Park, 27 views; Glacier National Park, 25 views; (7) Rocky Mountain National Park, 29 views; and (8) Grand Canyon National Monument, 24 views. Department of the Interior, Washington, D. C., 1916. [This panorama of remarkable photographs of some of the most remarkable scenery of the North American continent is well designed to fulfil its aim—the focussing of public attention on the great National Parks.]

PALMER, A. H. **An eruption of Lassen Peak.** Bibliogr. *Monthly Weather Rev.*, Vol. 44, 1916, No. 10, pp. 571-573.

PALMER, A. H. **California earthquakes during 1916.** Map. *Bull. Seismological Soc. of America*, Vol. 7, 1917, No. 1, pp. 1-17.

PARSONS, E. C. **Notes on Zuñi. Part I.** *Memoirs Amer. Anthropol. Assoc.*, Vol. 4, 1917, No. 3, pp. 151-225.

PERNOT, J. F. **Forests of Crater Lake National Park.** 38 pp.; ills., index. Dept. of the Interior, Washington, D. C., 1916. [See comment on G. F. Allen's "The Forests of Mount Rainier National Park," *Review*, Vol. 2, p. 386.]

SOUTH AMERICA

GENERAL

ROSS, E. A. **South of Panama.** xvi and 396 pp.; map, ills., index. The Century Company, New York, 1915. \$2.40. 8½ x 6.

This is one of the best books in English on the *people* of South America, especially as regards the first five chapters, Western Colombia and Ecuador, Peru, The Native Races, Chile, and Argentina. The last two thirds of the book, containing all sorts of summings up, has much of great interest, but also much repetition of earlier statements.

The author is not giving tourist impressions. He has no inclination to regard as bad or unprogressive all variations from his home habits. He is a trained observer, able to discern and to tell the truth. He shows what North America has, almost universally to learn from Latin America in good manners. The utter lack of male morality in sexual affairs is suggested as the reason for the "fuzziness" often noted in Latin American male minds, especially as it dates from the teens of practically the whole male population. At the same time the writer recognizes the high accomplishments of the small body of "intellectuals." Education is mostly at a fearfully low stage. The best work of the Protestants is not their missions but their schools. In Bolivia, for instance, they are the only good schools available and are bound to have a solid effect on the next generation, while the religious mission is of slight value. Good American women are said to be attempting the conversion of Bolivian Indians while they are themselves ignorant of both Spanish and Aymará!

Climate, race, and social history are indicated as causing the chief defects of Latin American character. Had our forebears happened into the same environment as the Conquistadores, we should show today the same ineffectiveness. Argentina he sets apart as a "white man's country" in all respects and more likely to grow into closer resemblance to the United States, without any recognition of its lack of equivalent for our resources of coal, iron, lumber, copper, and petroleum, which must forever hinder Argentine industrial development. It would not be fair to reproach the sociologist author with his neglect of the geographic environment, but the neglect is complete, except for the broad recognition of tropical climate as conducive to sexuality. What the author set out to give was a picture of the people, and he has given an excellent one.

MARK JEFFERSON

PRATT, E. E. **Trade conditions in Latin America as affected by the European War.** 26 pp. Reprinted from *Annals Amer. Acad. of Polit. and Soc. Sci.*, Vol. 6 (Publ. No. 902). Philadelphia, July, 1915.

ROORBACH, G. B. **Problems in the development of United States-South American trade.** Reprinted from *Univ. of Pennsylvania Public Lectures 1916-17*, pp. 407-420. [The paper calls attention to certain little-recognized geographical difficulties in the way of commercial intercourse between the United States and South America. In particular it is pointed out that the commercially developed parts of South America (Southern Brazil, Uruguay, and Argentina) are as accessible to Europe as to the United States, while the approximation of this region and the United States in the character of production is a bar to the reciprocal exchange that is the basis of trade. See also the abstract of this paper in the *Scottish Geogr. Mag.*, Dec., 1917.]

SAFFORD, W. E. **Food-plants and textiles of ancient America.** Ills. *Proc. Nineteenth Internatl. Congress of Americanists held at Washington, Dec. 27-31, 1915*, pp. 12-30. [Smithsonian Institution,] Washington, D. C., 1917. ["This paper is intended to call attention to the principal food-plants, textiles, and other useful plants which the Americas have given to the world."]

STUNTZ, H. C. **South American neighbors.** x and 217 pp.; map, ill., bibliog. index. Missionary Education Movement of the United States and Canada, New York, 1916. 60 cents. 8 x 5.

ULE, E. **Die Kautschukpflanzen Südamerikas.** 19 pp.; ill. (Vegetationsbilder). Ser. 12, No. 6. Herausgegeben von G. Karsten and H. Schenck.) Gustav Fischer, Jena, 1914.

EUROPE

RUSSIA

LEYST, ERNST. **Meteorologische Beobachtungen in Moskau im Jahre 1911**, 48 pp.; **im Jahre 1912**, 43 pp.; **im Jahre 1913**, 49 pp.; **im Jahre 1914**, 49 pp. Reprinted from *Bull. Soc. Imp. des Naturalistes de Moscou*, 1912-14.

A new series of meteorological observations was begun at the University of Moscow in November, 1892. Since then the work has been carried on without essential change except that the scope has been gradually extended. The scope of the work is unusually broad, including, for example, observations of soil temperatures, earthquakes, magnetism, and atmospheric electricity, as well as radio-activity of the atmosphere, ground air, and ground water. The latter series of observations was undertaken at irregular times mainly in order to provide practical work for students. The annual results for 1911-1914 are discussed by Professor Ernst Leyst in the publications now before us. Twenty years of observations, in the new series, were completed in 1912. In 1913 a new Fuess color

meter, for determining the color of the sky, was added to the instrumental equipment. The close proximity of the electric street cars necessitated, in the same year, a discontinuance of observations of magnetic variation. A new and useful feature of the annual summary for 1914 is a brief résumé of the general characteristics of the year.

R. DEC. WARD

SAROLEA, CHARLES. **Great Russia: Her achievement and promise.** xi and 252 pp.; maps. Alfred A. Knopf, New York, 1916. 7½ x 5.

Dr. Sarolea's little book on Russia is a very valuable addition to the recent publications on this subject. It is compact but comprehensible. In a series of terse, vivid chapters he covers a great many subjects, from the geographical foundations of the history of the Russians and their ideals of life to the literary expression of these ideals and lastly the burning questions of Russian politics.

Particular stress is laid on the influence of geographical conditions on the historical, economic, racial, and political problems of Russia. This point is argued more logically, consistently, and convincingly by Dr. Sarolea than by any previous writer. First he points out that the great Russian plain, extending for 6,000 miles from the western to the eastern limits of the country, determined the course of Russian history. If lack of natural barriers made for democracy, as is shown in many historic Russian institutions, at the same time it was bound to bring into existence a strongly centralized and militarized government to hold the plain against incursions and under a unity of rule. The tremendous distances, too, the lack of communication due to sparse population, and the harsh climate have more to do with hindering the political and intellectual development of the country than any government. In economic life as well, geographical conditions are so important that in spite of its prodigious mineral wealth Russia will always remain primarily an agricultural country. As for the forty-eight races gathered within the long frontiers of the Empire, it has been only through a strong central government that they have been kept at peace among themselves.

Lastly Dr. Sarolea explains the geographical orientation of Russian foreign politics, the "heliotropic" instinct which turned this northern people eastwards and southwards along the trend of their great river—he makes a striking picture of this endless march to the open sea. Altogether this book throws a new and clear light on Russia and will do much to direct the study of that country along normal and useful channels.

BLAKE, R. E. **The Russian village and the war.** *Scientific Monthly*, Vol. 4, 1917, No. 6, pp. 544-547.

DURAND, C. **Le marché intérieur de la Russie.** *L'Économiste Français*, 44th Year, 1916, Vol. 1, No. 18, pp. 580-582.

HIMNER, M. **Contribution à l'étude de la Podolie russe: Les méandres encaissés et les conditions du peuplement.** Ill. *Ann. de Géogr.*, No. 134, Vol. 25, 1916, pp. 116-123.

— **Houille blanche, La, et la houille grise en Russie.** Maps. *Rev. gén. des Sci.*, Vol. 26, 1915, No. 12, pp. 374-380.

— **Kara Sea route, The: Mr. Lied's fifth Enisei expedition.** *London Times Russian Section*, No. 27, 1916, Dec. 30, p. 10. [See the February, 1917, *Review*, Vol. 3, pp. 151-152.]

M—, ANT. **Le long du littoral de la Mer Noire.** *Recueil publié à l'occasion du vingt-cinquième anniversaire du Club Alpin de Crimée et du Caucase*, pp. 68-76. Odessa, 1915. [In Russian.]

RABOT, CHARLES. **La houille blanche en Russie.** Diagr., ills. *La Nature*, No. 2270, 1917, March 31, pp. 199-203. [Abstracted in the July, 1917, *Review*, Vol. 4, p. 61.]

— **Russia's new oil fields.** Map, ills. *Russia*, Vol. 1, 1916, No. 3, pp. 17-22. Martens & Co., New York. [Oil resources and prospects of the Ural Province. Oil locations are shown in a map reproduced from the *Journal of Petroleum Technology*.]

URQUHART, LESLIE. **The economic development of Russia and Britain's interest therein.** Map. *Journ. Royal Soc. of Arts*, No. 3340, Vol. 65, 1916, pp. 23-37 (discussion, pp. 35-37).

ITALY

BÉGUINOT, AUGUSTO. **L'ipotesi dell' "Adria" nei rapporti con la corologia delle piante e degli animali: Nota critica e programma di ricerche.** *La Geografia*, Vol. 5, 1917, No. 5-6, pp. 188-207. Novara.

BÉNÉVENT, E. La plaine du Pô: Étude de géographie humaine d'après le livre de M. Arrigo Lorenzi. Map. *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 1, 1916, No. 2, pp. 189-236. Grenoble. [Abstracted in the February Review, pp. 147-148.]

DE GASPERI, G. B. Grotte e voragini del Friuli (Materiali per lo studio dei fenomeni carsici, II). Maps, diagrs., ills., bibliogr. *Memorie Geogr.* (Suppl. to *Riv. Geogr. Italiana*) No. 30 (=Vol. 10, pp. 1-219). Florence, 1916.

GIORGI, COSIMO DE. Distribuzione delle piogge nella provincia di Lecce (Terr. d'Otranto). Map. *La Geografia*, Vol. 5, 1917, No. 5-6, pp. 210-212. Novara.

HUNTINGTON, ELLSWORTH. Climatic change and agricultural exhaustion as elements in the fall of Rome. *Quart. Journ. of Economics*, Vol. 31, 1917, No. 2, pp. 173-208. [Abstracted in the May, 1917, Review, Vol. 3, pp. 401-402.]

ISSEL, ARTURO. Cenni intorno ai termini geografici dialettali della regione ligure. Bibliogr. *Boll. Reale Soc. Geogr. Italiana*, Vol. 6, 1917, No. 7-8, pp. 487-508. Rome.

— Italia, Censimento della popolazione del regno d', al 10 giugno 1911. Vol. III: L'alfabetismo della popolazione presente. v and 230 pp. Vol. IV: Popolazione presente, di età superiore a dieci anni, classificata per sesso e per professione o condizione. vi and 553 pp. Vol. V: Popolazione presente, di età superiore a dieci anni, classificata per sesso, età e professione o condizione. vi and 363 pp. Vol. VI: Popolazione presente classificata secondo la religione—Popolazione presente classificata secondo il luogo di nascita—Proprietari di beni immobili—Ciechi—Sordomuti—Popolazione presente di età superiore a novanta anni—Stranieri—Famiglie—Convivenze non familiari. xi and 487 pp. Vol. VII: Relazione. viii and 265 and 467 pp. Direzione Generale della Statistica e del Lavoro. Ufficio del Censimento, Ministero per l'Industria, il Commercio e il Lavoro, Rome, 1916.

LORENZI, ARRIGO. Di alcuni supposti toponimi slavi della provincia di Udine ancora del manualetto di topolessigrafia della Venezia Giulia. *Riv. Geogr. Italiana* Vol. 24, 1917, No. 5, pp. 187-200.

MARANELLI, CARLO. Dizionario geografico dell'alto Adige, del Trentino, della Venezia Giulia e della Dalmazia. viii and 214 pp. Gius. Laterza & Figli, Bari, 1915. L.3.50. 9½ x 6½.

MARINELLI, O. La geografia in Italia. *Riv. Geogr. Italiana*, Vol. 23, 1916, No. 1-24; Appendici, No. 2-3, pp. 113-131.

MOCHI, ALDOBRANDINO. Aspetti e periodi del Neolitico nell'Italia continentale peninsulare. *Archivio per l'Antropologia e la Etnologia*, Vol. 45, 1915, No. 3-4, pp. 241-291. Florence.

PEDRAZZI, ORAZIO. L'alto Adige e i Tedeschi. *Boll. Reale Soc. Geogr. Italiana* Vol. 6, 1917, No. 7-8, pp. 538-550. Rome.

PRELLER, C. S. DU RICHE. The "Pietre Verdi" of the Piémontese Alps. The crystalline rock areas of the Piémontese Alps. Maps, diagrs. *Geological Magazine*, Decade 6, Vol. 3, 1916, No. 4, pp. 156-163; No. 5, pp. 198-205; No. 6, pp. 250-255; No. 7, pp. 304-313; No. 8, pp. 348-355.

PRINA, DEMOCRITO. Le Alpi Giulie. Maps, diagrs., ills. *Riv. Mensile del Club Alpino Italiano*, Vol. 36, 1917, No. 5-6-7, pp. 96-114.

ROLETTA, G. B. La valle dell'Orsogna. *Riv. Geogr. Italiana*, Vol. 23, 1916, No. 1-2, pp. 432-440; Vol. 24, 1917, No. 1-2, pp. 24-38. [An alpine valley in the Etruscan Apennines.]

RÖSSLER, JOSEF. Der Gardasee. 20 pp.; map, diagrs. (Suppl. to Schaffner's Arbeit und Kunst in der Schule, No. 18.) A. Haase, Prague, [1915].

SACCO, FEDERICO. L'esogenia quaternaria nel gruppo dell'Argentera (Alpi Marittime). 48 pp.; map. Reprint from *Giornale de Geol. Pratica*, Vol. 9, 1911, No. 5-6. Parma. [Describes the work of Quaternary erosion.]

— Sesia, L'alta Valle del, ed il Monte Rosa: Guida illustrata di Alagna Riva-Valdobbia, Valle Vogna. 108 pp.; maps, ills. G. Zanfa, Varallo. L.1. 7 x 4½.

SIMKHOVITCH, V. G. Rome's fall reconsidered. Reprinted from *Political Science Quart.*, Vol. 31, 1916, No. 2, pp. 201-243. [Abstracted in the November, 1916, Review, Vol. 2, p. 376.]

SZABÓ, L. Das geschichtliche Schicksal der östlichen Adria-Küste. Bibliogr. *A Tenger*, Vol. 6, 1916, No. 2, pp. 60-69. Budapest. [In Hungarian.]

AFRICA

EAST AFRICA

E POINTE, HENRI. *La colonisation française au pays des Somalis*. 98 pp.; map, ills. Jouve & Cie., Paris, n. d. 2 fr. 50. 10 x 6½.

This is a careful study of one of the lesser known parts of Africa. As the author shows, French Somaliland is, for the most part, a barren, rocky waste, but its situation gives it importance. It stands where the Red Sea merges with the Indian Ocean. Jibuti, its capital and chief port, is on the southern shore of the Gulf of Tadjura. It is a deep-water harbor and supplies with coal, water, ice, meat, and vegetables many vessels in the trade with China, Japan, India, the Persian Gulf, and the important islands of the Indian Ocean. The French first chose Obock, on the north side of the gulf, as the capital and port of the colony, but finding its harbor shallow and its climate trying they abandoned it for the more commodious, salubrious, and deep-water port of Jibuti. The great advantage of the port is that it is the best starting point for the rich region of central and southern Abyssinia and for Harrar, a thriving Abyssinian town of 40,000 people, surrounded far and wide by plantations of coffee, cotton, sugar cane, and oranges. The railroad has been extended to Harrar, 185 miles from Jibuti, but has not yet reached Adis Abeba, the capital of Abyssinia, where the road will tap the trade of a large part of that rich country.

Before the war, three trains a week were making the round trip between Jibuti and Harrar carrying merchandise, much of which was sent on by caravan to Adis Abeba. The native population of French Somaliland consists of Arabs, Danakils, Somalis, and Abyssinians. The book is a timely compilation. The gist of it is that the rock plains of French Somaliland are economically worth little but offer the most convenient route to the vast and rich area of southern Abyssinia.

CYRUS C. ADAMS

CARL, J. *Autour du Victoria Nyanza: Souvenirs de voyage en Afrique*. *Le Globe*, Vol. 55, 1916, pp. 29-52. Soc. de Géogr. de Genève.

DEMPWOLFF, OTTO. *Die Sandawe: Linguistisches und ethnographisches Material aus Deutsch-Ostafrika*. Diagr., ills. *Abhandl. des Hamburgischen Kolonialinstituts*, Vol. 34 (Reihe B; Völkerkunde, Kulturgesch. und Sprachen, Vol. 19), pp. 1-180. Hamburg, 1916.

GIUFFRIDA-RUGGERI, V. *Nuovi studi sull'antropologia dell'Africa orientale: Etnologia e antropometria della popolazione Eritreo-Somale-Abissina e delle regioni vicine*. Map, ills. Reprint from *Archivio per l'Antropologia e la Etnologia*, Vol. 45, 1915, No. 2, pp. 1-59. Florence.

LYONS, H. G. *German East Africa*. Map, diagr., ills. *Quart. Journ. Royal Geogr. Soc.*, No. 182, Vol. 43, 1917, pp. 175-194. [Abstracted in the *January Review*, p. 75-76.]

MORI, ATTILIO. *I risultati geografici di una missione scientifica in Somalia*. *Riv. Geogr. Italiana*, Vol. 23, 1916, No. 10, pp. 446-454.

WORLD AS A WHOLE AND LARGER PARTS

PINDEN, H. J. *The invention and spread of agriculture in America*. Map, ills. *Amer. Museum Journ.*, Vol. 17, 1917, No. 3, pp. 181-188.

Opinion today generally favors the independent origin of agriculture in the eastern and western hemispheres. In the western hemisphere, while agriculture may have arisen at more than one center, it is believed with some justification that Mexico and Central America constitute the single cradle region. The nearest wild relative of the cultivated maize plant is the "sacred maize" of the Aztecs. Maize with beans and squashes is common to all the cultivated areas of the Americas. The course of agricultural development is, however, to be traced by archeological rather than by botanical data. Associated with it is pottery manufacture, essentially the art of a stationary—and hence in general an agricultural—people. The sequence of pottery styles forms an indication of the sequence of agriculture. In the above article the relation between the two arts is illustrated by a map showing the pre-Columbian distribution in the Americas. The northern limit of pottery runs from southern California to the Gulf of St. Lawrence; the southern limit from south-central Chile (40° S.) to the Golfo de San Jorge, Argentina. On the west side of the continent, where the ceramic art is oldest, these limits roughly coincide with the areas of oldest agricultural development, that is in the arid highlands where irrigation is necessary. The eastern portion of the northern limit of pottery coincides with another and later type of agriculture, that under favorable temperate conditions. In the southern hemisphere the area under such agriculture was much more

limited, and pottery is distributed a good deal south of it. Within the tropics on the forested and humid lowlands a third type of agriculture is to be found.

SMITH, G. E. **On the significance of the geographical distribution of the practice of mummification: A study of the migrations of peoples and the spread of certain customs and beliefs.** 143 pp.; maps, bibliogr. Reprinted from *Memoirs and Proc. Manchester Literary and Philos. Soc.*, 1914-1915, Vol. 59, Part II. The Manchester Press, Manchester, 1915. 2s. 6d. $8\frac{1}{2} \times 5\frac{1}{2}$. [See the July, 1917, *Review*, Vol. 4, pp. 63-64.]

SPEER, R. E. **The unity of the Americas: A discussion of the political, commercial, educational, and religious relationships of Anglo-America and Latin America.** v and 115 pp. Layman's Missionary Movement, New York, 1916. $7 \times 4\frac{1}{2}$.

SPINDEN, H. J. **The origin and distribution of agriculture in America.** Map. *Proc. Ninetcenth Internatl. Congress of Americanists held at Washington, Dec. 27-31, 1915*, pp. 269-276. [Smithsonian Institution,] Washington, D. C., 1917.

VIVIER DE STREEL, E. DU. **Le rôle de nos colonies dans l'après-guerre.** 38 pp. Augustin Challamel, Paris, 1916. 1 fr. $9\frac{1}{2} \times 6\frac{1}{2}$.

PHYSICAL GEOGRAPHY

GEOLOGY AND GEOMORPHOLOGY

CASE, G. O. **Coast erosion and protection.** 50 pp.; diags., ills. Case Coast Protection Corporation, New York, 1915. 9×6 .

This pamphlet, based on an article published at the time in *Engineering News*, gives a very good, concise summary of the principles of shoreline action viewed from the standpoint of the engineer. The author is connected with a company interested in exploiting certain methods of coast protection described in the article; but it would be a mistake to dismiss his well-illustrated pamphlet as advertising literature of no special merit. One will not often find a more accurate and up-to-date statement of the elementary principles controlling the movement of littoral drift and the causes of coast erosion than are contained in the two dozen pages which the author devotes to these subjects.

"After carefully studying the conditions on the Atlantic and Pacific coasts" the author has reached the conclusion "that as a general rule the littoral drift is mainly due to oblique wave action" rather than to tidal or other currents. The theory of a moderate subsidence of the New Jersey and adjacent coasts is rejected, in view of the results obtained in the most recent investigations of this problem. Both of these positions seem to the reviewer to be well taken, though neither is in accord with the formerly accepted views of most physiographers and engineers. Further indications that the author has himself observed carefully, and has at the same time kept in touch with the work of others, will be noted by the reader.

DOUGLAS W. JOHNSON

HORNE, JOHN. **The influence of James Geikie's researches on the development of glacial geology.** Ill. *Proc. Royal Soc. of Edinburgh*, Vol. 36, 1915-16, Parts I-II, pp. 1-25. [Concludes with a list of Geikie's publications.]

IDDINGS, J. P. **Igneous rocks: Composition, texture, and classification; description and occurrence.** Vol. 1: xi and 464 pp.; diags., ills., index. Vol. 2: xi and 600 pp.; maps, diags., bibliogr., index. John Wiley & Sons, New York, 1909 and 1910. Vol. 1, \$4.50; Vol. 2, \$6.00. 9×6 each.

LUGEON, MAURICE. **Le striage du lit fluvial.** Ills. *Ann. de Géogr.*, No. 132, Vols. 23-24, 1915, pp. 385-393.

MEUNIER, STANISLAS. **A theory of terrestrial volcanoes and the geography of the moon.** *Journ. Washington Acad. of Sci.*, Vol. 6, 1916, No. 19, pp. 637-649.

NAVARRO, L. F. **L'état actuel du problème de l'Atlantide.** Maps. *Rev. de Géogr. des Sci.*, Vol. 27, 1916, No. 14, pp. 425-429; No. 15-16, pp. 459-466. [See also article by same author listed in *Review*, Vol. 2, 1916, p. 488.]

RIES, HEINRICH. **Economic geology.** 4th edit., thoroughly revised and enlarged. xviii and 856 pp.; maps, diags., ills., index. John Wiley & Sons, Inc., New York, 1916. \$4.00. 9×6 . [The first edition of this standard work was extensively reviewed in the *Bull. Amer. Geogr. Soc.*, Vol. 38, 1906, pp. 293-394. The third edition was noticed in the *Bull.*, Vol. 43, 1911, p. 219. In the present edition there have been "included a description of the more important Canadian mineral deposits, as well as brief reference to some of the well-known ones of other countries."]

WRIGHT, W. B. **The interglacial problem.** *Scientia*, No. 64-68, Vol. 22, 1917, pp. 87-94. Bologna.

HUMAN GEOGRAPHY

ANTHROPOLOGY AND ETHNOLOGY

LEITCH, ARTHUR. **The antiquity of man.** xx and 519 pp.; maps, diagrs., ills., index. Williams and Norgate, London, 1915. 9 x 5½.

This work deals with the problem of man's antiquity from the standpoint of the human anatomist. The author discusses in elaborate descriptions the skeletal remains of ancient man, particularly with regard to finds made in England. To the Piltdown man he devotes much space.

The book is an indication of the attention paid in recent years to the study of our prehistoric ancestors. A parallel interest on this side of the Atlantic is manifested by the publication among others of Professor Osborn's "Men of the Stone Age" and Madison Grant's "The Passing of the Great Race." To the geographer all these studies contain suggestions of paleo-geographical and racial problems which deserve attention.

DROOP, J. P. **Archaeological excavation.** x and 80 pp.; diagrs., index. Cambridge University Press, 1915. \$1.00. 8½ x 6.

FRAZER, J. G. **Questions on the customs, beliefs, and languages of savages.** 1 pp. Cambridge University Press, 1907. 6½ x 4.

HILZHEIMER, M. **Urgeschichte des Menschen.** (Naturwissenschaftl.-Technische Volksbücherei der Deutschen Naturwissenschaftlichen Gesellschaft. No. 74-75.) 98 pp.; 1 ls. Theod. Thomas Verlag, Leipzig, [1915]. 40 pf. 6 x 4½.

HOUGH, WALTER. **The distribution of man in relation to the invention of fire-making methods.** *Amer. Anthropologist*, Vol. 18, 1916, No. 2, pp. 257-263.

— **Man, The origin of.** 111s. *New York State Museum Bull.* 173, pp. 143-156. Albany, 1915. ["Adapted from a paper by Dr. E. Rivet of the Museum d'Histoire Naturelle, Paris, printed in *Biologica*, March 15, 1914."]

OSBORN, H. F. **The origin and evolution of life upon the earth.** Maps, diagrs., 111s., bibliogr. *Scientific Monthly*, Vol. 3, 1916, No. 1, pp. 5-22; No. 2, pp. 170-190; No. 3, pp. 289-307; No. 4, pp. 313-334; No. 5, pp. 502-513; No. 6, pp. 601-614.

WALLIS, W. D. **The influence of anthropology upon history.** *Scientific Monthly*, Vol. 5, 1917, No. 5, pp. 433-438.

ZIMMER, G. F. **The use of meteoritic iron by primitive man.** 111s. *Nature*, No. 2462, Vol. 98, 1917, Jan. 4, pp. 350-352.

ECONOMIC GEOGRAPHY

Production

SCHERER, J. A. B. **Cotton as a world power: A study in the economic interpretation of history.** 452 pp.; bibliogr., index. Frederick A. Stokes Co., New York, 1916. \$2.50. 8½ x 5½.

A book in the field of economics and history, but of interest also to geographers. This history does not cover the ground of the well-known supplementary readers on cotton, but it may be considered as supplementary to them. The history of cotton opens in the hazy realm of folk tales and tradition, passes rapidly into the early use of cotton in India, and then to the introduction of cotton into England. The transformation of England under the increasing growth in the use of cotton cloth is followed by the story of cotton in American history; first, a sectional evolution, then great political controversies as manufacturing establishments increased in numbers, the Civil War with the resulting cotton famine in England and France, and finally reconstruction with the beginnings of cotton manufacturing in the South. The book ends with an admirable section entitled "Cotton and World Trade," which summarizes the situation of the cotton market just previous to the war, the effect of this war upon cotton, and the future possibilities. If the book has a fault, it is its neglect of the influence of other factors and commodities in the development of England and the United States and its placing too high a value upon cotton as "king."

ROBERT M. BROWN

— **Agricultural legislation, International yearbook of (Vol. 5, 1915).** xcii and 460 pp. Internatl. Inst. of Agric., Rome, 1916. [Text in French, analytical introduction and table of contents in English.]

ALBES, EDUARDO. **El maíz.** 111s. *Bol. Unión Panamericana*, Vol. 43, 1916, No. 4, pp. 429-448.

— **Antimony ores, Occurrence and utilisation of.** *Bull. Imperial Inst.*, Vol. 14, 1916, No. 3, pp. 389-417.

BAEKELAND, L. H. **Renewing the earth from the air: The romance of the search for nitrogen.** Ills. *Scribner's Mag.*, Vol. 60, 1916, No. 5, pp. 547-556. [Abstracted under the title of "Production of Synthetic Nitrate" in the February, 1917, *Review*, Vol. 3, p. 153.]

BELLET, DANIEL. **La production de la potasse dans le monde.** *Ann. de Géogr.* No. 137, Vol. 25, 1916, pp. 377-382.

BELLET, DANIEL. **Un métal d'avenir: le vanadium.** *L'Economiste français*, 441 Year, 1916, Vol. 1, No. 8, pp. 230-232.

— **Cobalt ores, Occurrence and utilisation of.** *Bull. Imperial Inst.*, Vol. 1, 1916, No. 3, pp. 417-437.

— **Copper industry in 1914, World's.** Ills. *Mining and Engineering World*, Vol. 42, 1915, No. 6, pp. 266-278.

— **Copper production in 1915, The world's.** Ills. *Mining and Engineering World*, Vol. 44, 1916, No. 6, pp. 242-244.

— **Cuivre, Le commerce et l'industrie du, pendant les hostilités.** Ills. *L. Nature*, No. 2214, 1916, Mar. 4, pp. 150-155.

GEERLIGS, H. C. P. **De suikerindustrie in verband met den wereldoorlog.** *Indische Genootschap Vergaderingen*, 1915, Dec. 13, pp. 51-69.

— **Gold in 1915, The world's production of.** Ills. *Mining and Engineering World*, Vol. 44, 1916, No. 6, pp. 231-233.

HITIER, HENRI. **Les réserves de bétail dans le monde.** *Ann. de Géogr.*, No. 13, Vol. 25, 1916, pp. 81-96. [Abstracted in the February, 1917, *Review*, Vol. 3, pp. 150-151.]

KRAWANY, FRANZ. **Internationale Papier-Statistik.** viii and 250 pp. Verlag für Fachliteratur, Berlin and Vienna, 1910. 10½ x 7½.

MACFARLANE, J. J. **The cocoanut and its many products.** Ills. *Commercial America*, Vol. 14, 1917, No. 2, pp. 13, 15, 17, 19, and 21.

Distribution

— **European economic alliances: A compilation of information on international commercial policies after the European War and their effect upon the foreign trade of the United States; also an analysis of European and united commercial inter-dependence and treaty relations.** 118 pp. National Foreign Trade Council, New York, 1916. 25 cents. 9 x 6.

This little volume contains a good deal of information upon a question of vital interest to this country. It shows how the trade of the world was organized before the outbreak of the European War, and what portion of it has been disorganized since the outbreak of hostilities. It sketches the evolution of European commercial policy for the past century and emphasizes the significance of commercial treaties between nations as the basis of their trading relations. The resolutions passed at the Economic Conference of the Entente Allies held at Paris in 1916 are given in full, as well as the interpretations and explanations made by responsible representatives of the British and French governments. The proposed economic alliance of the Central Powers is also discussed. Finally, there is given, in detail, a tabular analysis of the trade of the United States with the warring nations. This shows, as one might expect, the predominance of the Allies in both our export and import trade.

AVARD L. BISHOP

BERGLUND, ABRAHAM. **The war and trans-Pacific shipping.** *Amer. Econ. Rev.* Vol. 7, 1917, No. 3, pp. 553-568. [Dislocation of former competitive conditions in the Pacific; the advantage of Japan; disadvantage of the Pacific Northwest of the United States. Referred to in the February *Review*, p. 77.]

HESS, R. H. **The waterways and commercial evolution.** Diags. Reprint from *Annals Amer. Acad. of Polit. and Soc. Sci.*, No. 895, 1915, May, pp. 1-24.

O'GORMAN, MERVYN. **Commercial aeronautics.** *Journ. Royal Soc. of Arts*, No. 3394, Vol. 66, 1917, pp. 38-48 (discussion, pp. 46-48).

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THE GEOGRAPHICAL DISTRIBUTION OF THE BALKAN PEOPLES

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[With separate map, Pl. III, facing p. 360.]

The various Balkan peoples are practically limited to distinct natural regions. The Aegean region is inhabited mainly by Greeks. The inhabitants of the Pindus region and its littoral and of the Epiro-Albanian coast are in general of Albanian and Aruman (Vlakh) origin. The population of the continental core and of the Adriatic coast is Yugo-(South) Slav. It is divided into two groups, the eastern Yugo-Slavs, or Bulgarians, who occupy the plateau of the lower Danube, the larger part of the Maritza basin, and the valleys of the Rhodope Mountains, and the western Yugo-Slavs, or the Serbo-Croats and the Slovenes, who inhabit the central and western regions of the peninsula. The Yugo-Slavs outside of the peninsula occupy a part of the Pannonian basin and some valleys of the eastern Alps. Finally, some of the arid districts, Pontic and Aegean, are inhabited by Turks.

The peoples of the Aegean and Pindus regions, the Greeks, the Albanians, and the Arumani, are the most ancient peoples. Their ancestors settled in the peninsula before the historic era. They may, therefore, in this sense be considered as the autochthonous inhabitants. The other peoples who entered later did not establish themselves in the peninsula until the Middle Ages, the Yugo-Slavs at the beginning, the Turks at the end of this period.

THE PEOPLES OF THE AEGEAN AND PINDUS REGIONS

The Greeks

The Greeks are confined to the Pindus and Aegean regions, with their Asiatic characteristics, and are closely related, ethnographically and historically, to the populations of the Aegean parts of Asia Minor. They

inhabited these regions in the remotest historical period and have not changed their abode to this day, although their ethnic composition has been profoundly modified. In spite of the vicissitudes of time and the change in their ethnic composition they have remained a seafaring people, of the Mediterranean type of life.

THEIR COMPLEXITY

The Greeks are possibly more complex in origin than any other Balkan people. The direct descendants of the ancient Hellenes have been preserved only on some of the Aegean islands and, to a less extent, on the mainland coast. Numerous "Romans" of Slav and Asiatic origin filtered into the Greek population of Thrace and Macedonia in the Byzantine period, and this ethnic process continued during the Turkish period. With the Greeks of Greece merged a large Slav population, which, at the beginning of the Middle Ages, penetrated into Epirus, Thessaly, Hellas,¹ and the Peloponnesus and the last remnants of which were not Greeized until after the fifteenth century. The Greeks also absorbed important groups of the ancient Thraeco-Illyrian population in Epirus, Macedonia, and Thrace. Thessaly from the twelfth to the fifteenth century was called Great Wallachia and was inhabited mainly by Arumani. They have been described by the Jewish traveler, Benjamin of Tudela (1173). During the same period Actolia was called Little Wallachia. The majority of these Arumani were Greeized. The Greeization continues to our day in Thessaly and in southern Macedonia. But beginning with the fourteenth century the most important process of assimilation was the Greeization of the Albanians in Greece—in the Peloponnesus, in Hellas, in Epirus, and in southern Albania. Particularly the "metanastasic"² current of the Turks discharged upon Greece. Even today, according to Philippson, there are in Greece, within the boundaries existing prior to 1912, 250,000 Albanians who are only superficially Greeized.

PREDOMINANCE OF HELLENIC CULTURE

In this ethnic conglomerate, surcharged with foreign elements, the Greek language and, apparently, the principal traits of ancient Greek mentality have nevertheless predominated. There is reason to believe that this result was only rarely achieved through the numerical superiority of the Greeks. The influence of geographical environment and particularly of

¹ In the restricted sense of Middle Greece, i. e. the elongated area lying between two depressions, the northern occupied by the Gulf of Arta, the Spercheios River, and the Euboean Sound, the southern by the Gulfs of Patras, Corinth, and Aegina.—EDIT. NOTE.

² The author suggests this term (derived from the Greek *μεταστάσις*, meaning "change of habitat") to designate the migrations of Balkan peoples caused by the Turkish invasion at the end of the fourteenth century and continued during the four centuries of Turkish rule, as distinguished from the migrations brought about by the great Slav invasion of the sixth century and the movements which resulted from the rise of the Balkan states during the period of Slav dominion. See the abstract of his paper on this topic under "Geographical Record" in this number.—EDIT. NOTE.

the manner of life have contributed much to its development. All the immigrant peoples, the Slavs, Albanians, Arumani, came into the Aegean region, with its Greco-Mediterranean type of life, from a different geographical environment. They imitated Greek ways and customs and adapted themselves to the Greek population, although it was not more numerous than the newcomers.

NORTHERN RACIAL LIMIT

The northern boundary of the Greek people was approximately defined by the first explorers of the first decades of the nineteenth century, especially the section between Saloniki and Constantinople. Along this line as well as the less known section between Saloniki and Kastoria, the Greeks come into contact with the Slavs. This is a frontier of contrasting languages, physical habitus, mental characteristics, and manner of life. For centuries this has been the most stable racial boundary of the peninsula.

Nevertheless it did not remain unchanged, particularly in the basin of the Maritza River and on the coast of the Black Sea. Before the foundation of the Bulgarian state in 1878, the Greeks inhabited in compact masses the valley of the Maritza as far as Adrianople as well as secluded areas north of the Rhodope Mountains, in which region they have maintained themselves to the present only at Stanimaka. Greeks also predominated on the Pontic littoral south of Balchik as far as the Bosphorus. During the last thirty or forty years the Greeks have emigrated or been expelled in large numbers from Bulgaria, and only insignificant groups are now left. Even on the Thraco-Macedonian coast the Greek population is not compact. It is interrupted by large groups of Turks, by enclaves of Bulgarians, and even by two enclaves of Serbs, those of Bayramiye and Karadja Alil, of whom the majority migrated at the beginning of 1913 to the environs of Skopje.

Between Saloniki and the Adriatic Sea the northern limit of the Greeks was always less stable. In this direction Hellenism has spread to a considerable extent by assimilating the Tosks and numerous Arumani. Furthermore the influence of the Greek-Orthodox church and of the Greek language and civilization makes itself felt even outside of the Grecized area, among the Tosks of southern Albania.

BOUNDARY BETWEEN GREEKS AND MACEDONIAN SLAVS

The ethnic boundary between the Greeks and the Slavs in southern Macedonia may be indicated more precisely. If one proceeds from Epirus and southern Albania along the Yanina-Lyaskovik-Kortcha road to the Prespa basin, no Slavs are met with as far as Prevtis Pass and Ivan Mountain, except for three villages in the Kortcha basin the inhabitants of which speak an archaic Slav dialect. This pass and mountain constitute a sharply defined boundary between the more or less Grecized Tosks and the Slavs.

Farther east, in going from the basin of the Bistritza by way of Kastoria into Macedonia the Slav population lies farther south. Kastoria has the aspect of a Greek city, with a Turkish minority and the Slavs semi-Grecized; but in the environs of Kastoria the Slav population predominates; an important section of it in the vicinity of Nesram is Moslemized. Side by side with the Slav villages are to be found Greek, Aruman, Turkish, and Albanian villages. Immediately southwest of Lake Ostrovo, in the district of Sari Göl, the boundary separates the Greeks from the Turks, who inhabit the environs of Kailar. It coincides practically with the longitudinal axis of Lake Ostrovo, although even to the north of the lake groups of Turks exist. There are besides in the northern part of the Sari Göl district some Slav villages, mainly the large villages of Patelik, Vrbeni (Ekshisu) and Sorovitchevo, which are connected with the compact Slav mass which commences north of the pass across the Malka Nidje in the basin of Bitolye (Monastir).

The Turks

There is a considerable difference between the distribution of the Turks before the beginning of the Ottoman decline at the end of the seventeenth century and their present distribution in the peninsula.

During the first period from the fourteenth to the seventeenth century the Turks constituted the majority of the population in nearly all the cities of the peninsula lying along the main longitudinal highways. Outside of these highways they formed an important part of the population of every city except in Dalmatia. There was also a numerous Turkish population beyond the peninsula, in the cities of Hungary. Furthermore in addition to the rural Turkish population in the southeastern part of the peninsula, the Turks began to found villages in other regions. Large numbers of the Turkish nomads, the Yürüks, natives of Asia Minor, established themselves with their cattle in the central and eastern parts of the Balkan Range, in the Rhodope Mountains, the Pirin Range, and in the mountains of Macedonia. The topographical names of these mountainous regions are Turkish, and this is the only trace left by the Yürüks, who, together with the Turkish population of the northern cities, have disappeared.

TURKISH ENCLAVES

The large bodies of rural Turkish population were always limited to the Thraco-Macedonian region with its Eurasian characteristics, and to the Pontic regions. Both these regions have a dry climate resembling that of the homeland of the Turks in Asia Minor. Even these large islands of Turkish population continually grew smaller, especially after the middle of the nineteenth century, in spite of the wealth of the *muhadjiri*. Constricting along the *natio militans*, the Turks became reduced in the constant

ars. and, furthermore, the armies and the cities alike were often decimated by contagious diseases.

These large islands of Turkish population are as follows: the group of eastern Bulgaria; the Thracian group, extending from Constantinople to Lake Takhino, near Seres; the Vardar group, extending in an almost uninterrupted strip from the Gulf of Orfano along the left bank of the Vardar as far as Skoplye; and the enclave of Kailar, where the Turks inhabit two small cities, Kailar and Djuma, and about a hundred small villages. Much of these villages as are situated on the margin of the fertile basin of Budjak are distinguished by a high degree of prosperity, a condition rare among the Turkish population of the peninsula.

In eastern Macedonia, between Seres and Drama, there is found a population of Greek-Orthodox Turks (4,500 inhabitants), followers of the Greek patriarchate. These Turks have Greek schools and often speak both Turkish and Greek. Their center is the hamlet of Zilyahovo (2,800 inhabitants).

In addition to these main islands and the other small ones which are indicated on the accompanying map, the Turks still constitute an important part of the population in all the cities lying outside of the limits of the independent states of the peninsula as constituted prior to 1912.

The Albanians

In contrast with the Greeks, the Albanians, although occupying the Epiro-Albanian coast since remotest antiquity, have not profited from their contact with the sea. They are neither sailors nor fishermen. They have practically no maritime intercourse along their own coast, nor with the countries across the sea. Although the belt of Mediterranean climate and vegetation along their coast is rather wide, the Albanians have little inclination for the Mediterranean manner of life and occupation. They have withdrawn from the coast, which is often marshy, to the hills near by and the mountains and valleys of the interior. They devote themselves principally to cattle-breeding, less to agriculture. They are almost strangers to their own coast. They inhabit mainly the mountainous ramparts of the Pindus and the southern slopes of the Prokletiye (the North Albanian Alps). Those who live to the north of the Shkumbi River, the Ghegs, are, by their occupations and mode of life, related to the populations of the continental core. Even the Tosks, south of the Shkumbi, although influenced by the Arumani and superficially affected by Greek civilization, are more closely related to the continental populations of the peninsula than to those of the Aegean regions. The majority of the Albanians adopted Islam after the Turkish rule began, and these Albanians have been supporters of the Turkish régime and the worst oppressors of the other races. The Greek-Orthodox Albanians in the south and the Catholic Albanians in the north, particularly the latter, constitute only an insignificant minority.

THEIR FOREBEARS, THE ILLYRIANS

The Albanians, as is well known, are the ancient Illyrians, Latinized to some extent during Roman rule. In addition they contain a certain Slav element, introduced especially during the Middle Ages.

Before the Yugo-Slav invasion the Illyrians occupied the western part of the peninsula from the middle Danube to Epirus and the central regions. A powerful Illyrian tribe, the Liburni, inhabited the Adriatic coast and islands; another, the Dalmatians, occupied the region between Spalato and Zhupanyatz in Bosnia. Around Lake Scutari were the well-known Labeati; their neighbors to the south called themselves the Prussites and were engaged in mining. In the neighborhood of Kroya, in the center of present Albania, lived the Albani. In the center of the peninsula, in the vicinity of Nish, in the Kossovo and Metohiya districts, and about the upper Vardar were to be found the Dardani; farther to the south the Peoni. The country of the Dessaretes lay in the region of Lake Okhrida. The Epirotes and the Macedonians were also Illyrians. Little is known about the Illyrian tribes. They were practically independent and were divided into numerous clans; the Dalmatians, for instance, were divided into 342 clans. Redoubtable warriors, they offered desperate resistance to the Roman occupation of their country, as witness the conflicts between the Romans and Queen Tenta of Scutari and also the insurrection of the Illyrians of Dalmatia and Pannonia, who raised against the Romans an army of 200,000 foot soldiers and 8,000 horsemen.

SLAVICIZATION OF THE ALBANIANS

All the other Illyrian tribes, except those of the Albania of today, were Slavified during the Middle Ages. It appears that a part of the Illyrian population withdrew from the central and northern districts of the peninsula to Albania. But even in this region and in Epirus at the end of the tenth and the beginning of the eleventh century the valleys and plains were inhabited by the Slavs, while the Albanians and the Arumani occupied only the mountains. At the time of the reign of the House of Anjou (1250-1350) there was still a Slav population in the coastal plains and about the Drin River. This population, according to the studies of K. Jireček, was considerably reinforced by immigrants from Serbia during the Serbian rule, particularly in the fourteenth century. In the heart of Albania today one may still meet the last survivors of this semi-Albanized Serbian population. According to their traditions the tribes of northern Albania are of mixed origin, Albano-Serb. They consider themselves related to the Serbian tribes of Montenegro. The national hero of the Albanians, Skanderbeg, was, as is well known, of Serbo-Albanian origin. Just as the Yugo-Slavs assimilated numerous Illyrians, from the Danube to southern Macedonia, they were themselves Albanized in Albania, particularly during the Turkish period.

THE EASTERN BOUNDARY OF THE ALBANIANS

As a consequence of this process of assimilation the eastern boundary of the Albanians, or the ethnographic boundary between the Albanians and Serbs, has undergone important displacements, which it is necessary to trace.

There existed, even during the Turkish period, west of Lake Okhrida a scattered Slav population extending as far as the vicinity of Elbasan. Of this type were the present Albanized Slavs, who live in the Mokra district, the headwater valley of the Shkumbi.³ The Opara region on the left bank of the Devol River was inhabited by Slavs in the sixteenth century—"il paese d'Opari, ch' è habita de Schiavoni," wrote Musachi, an Albanian, in 1510.⁴ There are Slav families who migrated from the Opara region into the Monastir basin. In the Kozyatchia region along the upper Pchinya northeast of Skoplye are to be found Serbian families originating from the vicinity of Elbasan. Lejean has called attention⁵ to small enclaves of Serbian population on the Albanian coast near the mouth of the Viosa River, on the Arzen River, and to the north of Durazzo. To the west of the Opara region and of Elbasan lies the Musakiya region, around the mouth of the Temeeni—to the south of this river, Lesser Musakiya, to the north Greater Musakiya, inhabited by the Tosks, known as Bapidi and Farsherioti, an Aruman population whose occupation is agriculture and cattle breeding. The geographical names of the Musakiya region, particularly of Lesser Musakiya, are Slav. Numerous Slav herdsmen from Dibra were in the habit of wintering in the Musakiya region only three decades ago. It is from them or from the ancient Slav population of this region that this nomenclature is derived.

REGIONS OF SLAV PREDOMINANCE

While the Slav population west of Lake Okhrida has disappeared, either by assimilation or emigration, the Slavs have maintained themselves north of the lake on the left bank of the Black Drin River. In this area, the Drinkol district, there are large villages of Serbs (Labunishte, Vehtchane, Borovatz, Yablanitza), or of Moslemized Serbs (Trebishte). Albanians and Slavs dovetail, especially north of the gorge of the Black Drin, i. e. north of Dabovlyane. The largest island of Serbian population is that of the Golobrdto district (between the headwaters of the Shkumbi and the Matya), a population of archaic character and partially Moslemized. To the southwest and north of the Golobrdto district, in the Tchermenika and Bultchizi districts and the valley of the Matya, one meets with numerous Albanians of Serbian origin who have conserved Serbian and Christian customs. Several Serbian families on the other (right) bank of the Drin, in the Mala

³ For locational details not entered on the accompanying map, especially district names, consult the sheets of the map of the Balkans, 1:250,000, published by the Geographical Section of the General Staff, War Office, London.—EDIT. NOTE.

⁴ Charles Hopf: *Chroniques gréco-romaines*, Berlin, 1873, p. 280.

⁵ G. Lejean: *Ethnographie de la Turquie d'Europe*, *Ergänzungsheft No. 4 zu Petermanns Mitt.*, with ethnographic map, 1:2,500,000, Gotha, 1861.

Reka district (basin of the Radika River), originate from these three regions of Albania. They maintain relations with their Moslemized and Albanized parent stocks, visit one another during festivals, and practice the vendetta among themselves.

The Golobrdó region, west of, and the monastery of St. Yovan Bigorski east of the Drin, in the valley of the Radika, have served as a shelter against Albanian penetration. To the south and north Albanians have advanced farther into Macedonia and Old Serbia (see the map).

DIBRA AND ITS NEIGHBORHOOD

The city of Dibra is inhabited by numerous beys of Turkish and Albanian origin, the most powerful in Macedonia. Its life is very much "*à la turca*." Every Slav or Aruman *petchalbar* was formerly obliged to render tribute to the beys in the shape of furniture, harness, jewelry, etc. Severest persecution was practiced against the Christians of the city and of the whole region. There are Turks even in the villages, particularly in the *zhupa* of Dibra. Through these Turks part of the tribe of the Miyatzi were Moslemized, but in contrast with all the Moslemized inhabitants of these regions they have not become Albanized. Like the Moslemized inhabitants of Bosnia and the former *sandjak* of Novibazar, they speak Serbian. To the north of their district there is to be met with, in the gorge of the Radika a curious population, Christian and Serbian, which is ignorant of Serbian and speaks only Albanian and is furthermore filled with hate against the Moslemized Albanians. The geographical names of this district are often Serbian, and the Albanian spoken in it contains a number of Serbian words. This population seems to represent a Serb-Aruman amalgam, having conserved its religion but forgotten its language as a consequence of the proximity of the Albanians and of some villages of Albanian immigrants.

THE LYUMA REGION

Along the eastern side of the valley of the Black Drin and of the White Drin from Pishkopeya (44° 43' N.) by way of Bitzan and Lyum-Kula as far as the barrier Zhur to the west of Prizren extends the Lyuma region. Its geographical nomenclature is generally Serbian. In the seventeenth century it was still occupied by a Serbian population, into which penetrated the Albanians of Albania, so that it became Albanized. In the *zhupa* of the Shar Planina and in the Opolye, immediately south of Prizren, Albanization took place only in the eighteenth and nineteenth centuries. The most recent Albanization has taken place in the *zhupa* of Gora, whose inhabitants still speak Serbian. There are families some members of which are Greek-Orthodox and Serbian and others Moslem and Albanian.

THE NORTHERN BOUNDARY OF THE ALBANIANS

The part of the peninsula which has undergone the greatest ethnical changes is the belt lying between Scutari and the Southern Morava and

Leskovatz. The region between Scutari and Prizren (Pilot and Reka) was occupied in the Middle Ages by a mixed population, Serbian and Albanian. Serbs predominated in the basins and valleys, Albanians in the mountains. Scutari and the plains surrounding the Boyana and the Drin, the Zadrin and the Zaboyana districts, were occupied by Serbs; likewise the Metohiya and Kossovo districts. After the Turkish invasion the Albanians came down from the mountains, a part of the Serbians emigrated, and the rest were Moslemized and Albanized. The Serbian emigrants called themselves Skadrani. They are to be found in the region of the Drina in Serbia, in the Sredska *zhupa* of Prizren, in the cities of the Kossovo and Metohiya districts and of the valley of the Southern Morava.

FARTHERMOST ALBANIAN ENCLAVES

After the great Serbian migrations from the Metohiya, Kossovo, and the Southern Morava districts an immense expansion of the Albanians took place. The farthest islands of Albanian population, some 300 kilometers from their place of origin, were those to the west of Leskovatz, in the Masuritza region, to the north of Vranje, and in the Peshter region south of Syenitza. They have been indicated on all the older ethnographic maps. They existed until 1878. At this time, Serbia having occupied the region of the Southern Morava, these Albanians emigrated, mainly to the valley of the Lab (north of Prishtina), the Kossovo region, and the Metohiya region, reinforcing the Albanian population already there. The Albanian islands in the vicinity of Leskovatz and of Vranje exist no longer, while the Albanian island of the Peshter district has survived the occupation of 1912. About the year 1700 the Klimentis established themselves in the vicinity of Lake Scutari and exchanged Catholicism for Islam. They speak Albanian and Serbian.

Regions occupied by a mixed Serbo-Albanian population are the Metohiya and Kossovo.

The Arumani (or Vlaks)⁶

The Arumani are a disappearing people. Today there are not more than 154 Aruman communities, with 150,000 to 160,000 scattered individuals, chiefly in the southern part of the rampart of the Pindus and in the central and southern parts of the Balkan Peninsula. They may almost be termed an uprooted people. They occupy no large area of their own. Even where small groups of them occur, they do not cultivate the soil—they are not agriculturists—and they are only slightly connected with the geographical environment in which they live. They are above all the wandering shep-

⁶ On this relatively little-known people consult also A. J. B. Wace and M. S. Thompson: *The Nomads of the Balkans: An Account of the Life and Customs Among the Vlachs of Northern Pindus*, New York, 1913 (reviewed in *Geogr. Rev.*, Vol. 1, 1916, p. 319). The spelling used in this article is that given by these authors as the native form (p. 2, and vocabulary, p. 307). Professor Cvijić, in his manuscript and in the paper cited in footnote 8, uses the form Aromuni.—EDIT. NOTE.

herds of the peninsula, veritable nomads who migrate from the highest Balkan mountains to the coast and back again. Those who settle down in villages do not stay there long. Their villages are not like ordinary villages. Around them there are no cultivated fields, not even vegetable gardens, nor cattle. They only serve as shelter for the women and children, to provide for whose living the men scatter throughout the cities of the peninsula.

THEIR HISTORY .

The Arumani are the last descendants of the semi-Latinized Balkan populations. They are undoubtedly more Latinized than the Albanians; and, furthermore, they seem to differ from the Albanians particularly in being, together with the Greeks of Thrace and Macedonia, the most Byzantinized group of the peninsula.

During the Middle Ages the Arumani were still very numerous in the mountains and the secluded regions of the peninsula. They constituted, as has been indicated, the majority of the population in Thessaly and in Aetolia, or Great and Little Wallachia (Vlakhia). White Wallachia was a well-known designation in the Balkans and north of the Balkan Range; it was the Vlaks of this region who, with the Bulgarians, founded the Vlakho-Bulgarian kingdom under the dynasty of Asen in the twelfth century. During the same period the name Black Wallachia was current in what is now Moldavia. In the eleventh century the Arumani inhabited a part of the Dobrudja and the vicinity of Anchialos on the Gulf of Burgas. They were known in Thrace in the thirteenth century. In Serbian documents of the Middle Ages the presence of Vlasi (Vlaks, Arumani) in the mountainous regions to the southwest of the Shumadiya as well as in the vicinity of Prizren is often referred to. However, it is not always possible to decide whether the name Vlasi was used to designate the real Arumani or, because of their pastoral occupation, the Serbian shepherds.

The Arumani have become Slavicized and Grecized and have completely disappeared from the villages or entire districts where they were still to be found two centuries or even one century ago. Several explorers have stated that at the end of the eighteenth century the number of Arumani in the central and Pindus regions of the peninsula amounted to between 400,000 and 500,000. It is a curious fact that they became Moslemized only very rarely. For instance, the Arumani of Meglen in eastern Macedonia first amalgamated with the immigrant Petchenegs and did not become Moslemized for 200 years or more.

THEIR PRESENT CONDITION

Of the continually diminishing 150,000 to 160,000 Arumani who have survived to this day a certain proportion are wandering shepherds, devoting themselves to the raising of sheep and living during the summer in temporary dwellings, called *kalivas*. They are to be found scattered

throughout the mountains of the peninsula from the Stara Planina in Serbia and Bulgaria to the mountains of the Peloponnesus. There they spend the summer without having to prepare fodder for the winter, inasmuch as they come down from the mountains with their herds to pass the severe season of the year on the coast of the Aegean or—a few—on the Adriatic. For various reasons the Aruman shepherds are abandoning cattle breeding and are increasing the numbers of the semi-sedentary type of their fellows.

These Arumani have lived for centuries in large compact settlements, comparable to cities, which are always located in sheltered positions and at elevations of at least 800 to 1,000 meters. It is especially these Arumani who have no connection with the ground on which are built their houses. As a regular thing they live away from their homes, extra-territorially, so to speak, in the cities or villages of the surrounding region, where they go to earn their living and make money. That is the *petchalba* of the Arumani. Only rarely do they go beyond the limits of the Balkan Peninsula.

In all the cities of the central and eastern parts of the peninsula there is to be found a third kind of Arumani. These have permanently settled in the cities, particularly along the longitudinal routes, where they practice various trades for the time being, often as keeper of a café or in some commercial occupation.

THE PEOPLES OF THE CONTINENTAL CORE

The Yugo-Slavs

The Yugo-Slavs (i. e. Southern Slavs) occupy the continental core in its entirety. While no people of the Aegean and Pindus regions are agriculturists, the Yugo-Slavs of the continental core are true agriculturists, a people habituated to the plow. They are often also horticulturists. However, there are mountainous regions where cattle raising predominates over agriculture. The Adriatic group has adapted itself completely to Mediterranean and maritime occupations. The Yugo-Slavs are a peasant people. They devote themselves principally to agriculture and live almost exclusively in villages. Their country contrasts with the Aegean regions, where the cities are more numerous, where the villages often have the aspect of cities, and where the differences between the urban and rural population are much less than in the continental core.

DIFFERENTIATIONS

The Yugo-Slavs occupy not only the largest area of the peninsula, but, with their co-nationals, they are also very numerous in Austria-Hungary. They number about 16,000,000, but do not form a compact population. A differentiation took place between the eastern Yugo-Slavs, or Bulgarians, who today number some 4,000,000 to 5,000,000, and the western Yugo-Slavs,

who number more than 11,000,000, namely 7,000,000 Serbians and 4,000,000 Croats and Slovenes. The first differentiations that took place were due to the topography, which is considerably different in the east (the plateau of the lower Danube and the large and uniform basin of the Maritza) from what it is in the central and western districts, particularly in the Dinaric and Karst regions. To these should be added the differences in racial composition. In the east it was mainly the Thracians who were assimilated by the Slav and Bulgarian tribes. In the west it was the Illyrian tribes and possibly remnants of the Celts who merged with the Slavs. A very important event was the invasion of the Bulgarians and the union of these Ugro-Finnic elements with the Slavs who inhabited the plateau of the lower Danube. This Slav-Bulgar amalgam assimilated large numbers of Cumans and Petchenegs.

The differentiation of the Yugo-Slavs was accentuated by the formation of the Serbian, Croatian, and Bulgarian states in the Middle Ages. The differences among these Yugo-Slavs began to disappear during the long Turkish domination. In addition during this period two developments took place which were of great racial import.

EVOLUTION OF SERBIAN NATIONAL CONSCIOUSNESS

After the battle of Kossovo and after the successive annihilation of the Serbian states a strong Serbian national consciousness developed, which mainly by reason of the migrations, spread even beyond the areas included in the medieval Serbian states. Apparently this national consciousness and definite national aims developed at the end of the fourteenth and during the fifteenth century in the region extending from the Kossovo district to the Narenta on the north and from the Adriatic Sea to the eastern borders of the Shumadiya. From there it spread to other regions inhabited by the Serbs. As if by a systematic education all the Serbs became imbued with an elevated national sentiment and with the feeling of an obligation to fight for liberty, justice, and the restoration of their independent state. Through this community of sentiments and ideas the Serbs became closely knit together, passionately devoted to their national ideal.

THE SERBIAN CHURCH

The Greek-Orthodox faith and Serbian nationality, the merging of which began at the time of St. Sava at the end of the twelfth century, fused completely at the end of the fifteenth century and from then on became inseparable. The Greek-Orthodox faith almost lost its dogmatic and ecclesiastical character, and, assuming almost a racial character, it became the Serbian church *par excellence*. The Church was almost as integral a part of the national character as the folklore. The Greek-Orthodox faith found a powerful organ in the Serbian patriarchate of Pety, which was reinstated in 1557 by the vizier Sokolovity, a Moslemized Serb from Bosnia. The popes

and priests identified themselves completely with the people. These were not only their flock; they were their people, body and soul. The clergy wore only the national costume, except during religious services. They considered themselves simply a part of the nation, fulfilling its religious functions. The bishops and their emissaries visited frequently all the regions belonging to the patriarchate of Pečy, from the Save and the Danube as far as Skoplye and Küstendil, and contributed to strengthening the national hopes. Around the churches numerous printing establishments grew up from the sixteenth century on. The patriarchate restored numerous churches and ruined monasteries. Popular meetings, the *sabors*, which were held about these churches, became institutions where the national ideas and the program for the future were developed still further. The liberation of the nation became the supreme object of the "Serbian Church." The national motto was expressed in a few simple and clear words—"An unceasing fight for the sacred cross and for national liberty."

The Church having become the organ of the thought of the nation, no great migration took place without the popes. In emigrating with the people they took with them across the mountains and beyond the Save and Danube the ecclesiastical books, the sacred objects of the Church, and the relics of the saints, not out of bigotry, but because they considered these objects as national relics.

As a consequence of these migrations the Serbs have transferred and transmitted by contact this elevated national consciousness and numerous intense characteristics to the Yugo-Slav population living outside of the peninsula, who, incidentally, were more advanced in material civilization. But inasmuch as the "metanastasic" currents were directed toward the north this new evolution of the national consciousness, which was accompanied by an evolution of the language, has hardly affected the southern parts of the peninsula.

EVOLUTION OF THE BULGARIANS

An entirely opposite process took place among the Bulgarians, in the regions of the plateau of the lower Danube and the Maritza basin. During the Turkish rule the Bulgarians bowed their heads, submitted completely, and became the most abject *raya* of the peninsula. To say nothing of their mental traits, this complete submission was facilitated by the fact that their country was nearer to Constantinople and that its flat and unforested character favored the development of an economic régime of fiefs, the *tchifliks* of the Ottoman beys. This was the part of the peninsula where the régime of the *tchifliks* was most severely applied. All Bulgarians became the *raya*, cultivators of the soil for the beys. The name "Bulgarian" lost its national significance and was used only in the sense of *raya*, laborer, peasant. It is said that even as late as the middle of the nineteenth century Bulgarian city dwellers and the more educated Bulgarians were ashamed of this name,

and that it is only since the creation of the exarchate and the liberation of Bulgaria that the name Bulgarian has begun to assume a national meaning.

SIGNIFICANCE OF THE NAME

During the Turkish period the name Bulgarian in the sense of *raya* and as connoting servility began to spread even beyond Bulgarian territory, among the whole population of the *kmets*, the *raya* cultivating the estates of the beys. The region in which this strict economic régime was carried out extended as far as Nish. The name Bulgarian was applied by the Turkish officials and by the Greeks to this whole population without distinction of nationality, to the population of the regions forming the center of the Serbian state of the Nemanityi dynasty, which was subjected to the régime of the *tchifliks* and which was the most oppressed. In this sense the name of *bugar* (Bulgar) was used in the Vardar region and began to spread to the Kossovo and Metohiya districts. A Russian traveler of the seventeenth century even applied the name Bulgarian to the *kmets* of the neighborhood of Sarajevo in Bosnia. In the extreme western part of the peninsula, in Dalmatia and Croatia, as well as in the part of Serbia along the Morava River, the term Bulgarian had no other meaning than that of a rustic and common fellow, and the people of these regions call the popular songs *bulgarstize* (Bulgarian songs).⁷

The name Bulgarian, in the sense of an inferior and boorish social class, thus spread during the course of the Turkish period beyond the areas of Bulgarian nationality. Under the hard economic régime and Turkish oppression the population of these regions almost completely forgot their historic traditions. Their national consciousness did not develop as in the Dinaric regions.

SERBO-BULGARIAN TRANSITION

There are especially two regions lacking in national consciousness although they have preserved some traces of historical Serbian traditions: Macedonia proper, and the region of the Shopi, a people who constitute from the ethnographic viewpoint the transition between Serbians and Bulgarians. The Shopi of a part of western Bulgaria, particularly those of the regions of Trn, Bryeznik, and Kula, as well as the population of central Macedonia, are doubtless more closely related to the Serbians than to the Bulgarians. The writer does not wish to make this general discussion polemical and therefore refers the reader who is desirous of greater detail to his earlier publications.⁸

CONFUSION OF THE ISSUE

It is because of the extension of the name Bulgarian in the sense outlined that some earlier travelers and explorers, unfamiliar with the Yugo-Slav

⁷ For more details see J. Cvijić: *Questions balkaniques*, Attinger, Paris and Neuchâtel, 1916.

⁸ More especially: *Die ethnographische Abgrenzung der Völker auf der Balkanhalbinsel*, with map 1:1,500,000, *Petermanns Mitteilungen*, Vol. 59, 1913, Part 1, pp. 113-118; 185-189; 244-246.



ETHNOGRAPHIC MAP OF THE BALKAN PENINSULA

BY
JOVAN CVIJIĆ

Scale 1 : 3 000 000

- | | | | | | |
|--|---------------------------------|--|----------------------------------|--|---------------------|
| | Slovenes | | Greeks | | Greek-Orthodox |
| | Serbo-Croats | | Rumanians and Armanians (Vlachs) | | Moslemized |
| | Macedonians | | Turks and Tatars | | Moslem |
| | Serbo-Bulgarian transition area | | Albanians | | Greek-Orthodox |
| | Bulgarians | | Italians | | Moslemized (Pomaks) |
| | Czechs | | Mayjars | | |
| | Slovaks | | Germans | | |
| | Russians | | | | |

The names are rendered as far as possible in the language of the predominant race of a given region. All names (except Italian and German) have been transliterated, whether they belong to languages using Latin characters (e.g. Magyar, Rumanian, Croatian) or not. The transliteration is according to sound, except for modern Greek, where it is according to letter. The system followed is that of the Royal Geographical Society (*Hints to Travellers*, 9th ed., London, 1906, Vol. 2), except for these changes and additions: ch for ch; dj for j; ts for ts; o like German o; or French eu; u like German u or French u.

Political boundaries as in July, 1914.

languages and the special conditions and real sentiments of the population, have made the mistake of considering the name Bulgarian as a national name. The ethnographic maps of this earlier time, based on this incorrect observation, have done much to confuse the main Balkan question, namely that between Serbians and Bulgarians.

The Northern Contact Zone of the Yugo-Slavs

It is easier to determine the limits between the Yugo-Slavs and their neighboring peoples on the north, those where they come into contact with the Italians, Germans, Magyars, and Rumanians. These peoples are so different from the Yugo-Slavs that there should have been no ambiguity in determining the boundary between them, if a confusion of the issue through accessory questions had been avoided. Furthermore, Hungarian statistics are often inaccurate.

WITH THE ITALIANS

Numerous Italian writers have attempted during the present war to show that the natural frontiers of Italy on the east are not the well-known frontiers of the Apennine Peninsula. These natural frontiers, so say these writers, include part of the Balkan Peninsula as far as the divide between the Adriatic drainage and that of the Save, so that a large part of the Dinaric region as far as the highest range would, from the geographical and natural point of view, belong to Italy. These are also, so they say, the strategical frontiers recognized as necessary for the security of Italy. In order to confirm these claims by ethnographical facts the Italian writers add that the number of Italians several decades ago was greater on the eastern coast of the Adriatic than it is now and that they have been Slavieized because Austria has favored the Yugo-Slav propaganda.

It is hardly necessary to repeat here the results of the fundamental and well-known geographical and geological investigations concerning the region, that is to say that the Karst and the Dinaric system are integral parts of the Balkan Peninsula and that the natural boundaries of a peninsula like that of Italy cannot be sought for on the eastern side of the Adriatic. It is very clear even to an untrained observer that this sea marks the natural boundary between the Balkan and Italian peninsulas. The strategic security of Italy, if it really is menaced from the Yugo-Slav side, constitutes a political and military problem which can be solved on this basis but which has nothing to do with scientific investigations. The only fair argument to a certain extent is that the number of inhabitants classed as Italians and belonging to the Italian portion of Dalmatia, in the Quarnero and Istria, was larger some decades ago than at present. These people, however, were not Italians, but Italianized Slavs. After the Serbo-Croat awakening they returned to their original

nationality. Except in western Istria and in Trieste Italians did not exist as a nationality, even in former times, anywhere in the Balkan Peninsula. Italians have established themselves there only as individuals, except at Zara and at Fiume, where they form an important minority.

WITH THE GERMANS: THE SLOVENES

To the northwest, toward the Germans, the Slovenes constitute the racial frontier and barrier. This frontier shifted considerably to the south during the centuries, and numbers of Slovenes were Germanized, especially as a consequence of the aid which during the preceding centuries the Catholic Church rendered to Germanism. The Slovenes were entirely Germanized in the southeastern part of Upper Austria, in the regions of Salzburg and Lungau, in the eastern part of the Pustertal, in the vicinity of Lienz in the Tyrol, and in the larger part of Styria and Carinthia, where today they only occupy the southern districts. Germanization had even begun in the cities of Carniola, but it was stopped, from the middle of the nineteenth century on, by the Slovenian awakening, and the same process went on in Dalmatia. Numerous Slovenes, already half-Germanized, returned to their original nationality. From that time on the boundary between the Slovenes and the Germans in Styria and Carinthia has remained practically unchanged.

WITH THE MAGYARS

The most considerable displacement toward the south was that undergone during the last three centuries by the northern edge of the Serbo-Croats in southern Hungary. Numerous large Serbian islands on the right bank of the Marosh as well as those of Komarom, Djur, St. Andrew, Budapest, and others were Magyarized. Magyarization took place in the Barany and in the "Croatian archipelago." Uplifted to the height of a sacred state policy, Magyarization made progress in the Banat and the Batehke, particularly in the latter region. The Magyar propaganda fell with particular vehemence on the Catholic Serbs, the Bunyevtzi (Bunyevatzes), who constitute the majority of the population in Szabadka and Baya, and on the Serbs of Krashova in the eastern Banat. The total result of Magyarization appears to be superficial. As soon as these districts become independent the Serbo-Croats will return to their nationality, as was the case in Dalmatia and the cities of Carniola. It is not possible, without making studies on the spot and without using the statistics of the Serbian patriarchate of Karlovtzi, to determine exactly, from Hungarian statistics, the sections where the Serbians constitute the majority or the most important part of the population, which is often very mixed. Hungarian statistics suppress tens of thousands of Serbians; they also reduce the number of other non-Magyar nationalities.

WITH THE RUMANIANS

As a result of the natural expansion of the Rumanians the Serbians have lost ground in the eastern Banat, especially, it appears, during the last decades of the nineteenth century. First the Serbian islands of the valley of the upper Temesh disappeared, particularly those of Lugosh and Karanhebes, still well known at the beginning of the nineteenth century. Then during the last centuries, the Rumanians descended into the plain of the Banat and filtered in among the Serbians. The Serbian island of Krashova has maintained itself against the Rumanians thanks to its Catholic faith. The racial limit between the region of Serbian predominance and that of Rumanian predominance passes about to the east of Vershets and of Bela Crkva (Weisskirchen).

THE ISLANDS OF JUAN FERNANDEZ

By CARL SKOTTSBERG

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A fine morning in the month of August, 1908, found my companion and myself climbing the steep and narrow ridges of Mas-afuera, the more remote of the Juan Fernandez Islands off the Chilean coast. We were eager to reach the high crest of that little island, for we knew that no scientist had ever set his foot on that particular spot. We were in great haste, for our time was short, as our vessel, a large Chilean government transport, must get away from the wretched anchorage as soon as possible. It was the accomplishment of an old ambition: for many years I had longed to see the famous island of Robinson Crusoe, Juan Fernandez, and the other members of its group.¹ And during my expedition to Patagonia and Tierra de Fuego, in 1907-09, I had quite unexpectedly obtained an opportunity to visit the islands. Unfortunately only twelve days were at my disposal, and the season was winter.

DISCOVERY OF MAGELLANIC FLORA

I was more or less familiar with the island flora, and the only investigation previously made in Mas-afuera did not hold out much hope of any great discoveries in my line. "Grass and thick mats and beds of ferns right to the top"—thus ran the description of Dr. Federico Johow, the eminent Chilean botanist. But the tracks on his sketch map clearly showed that he never reached the high part of the island.² Above the forest we trod the grass of extensive meadows, but as we continued upwards the scenery changed. Outcrops of hard rock formed picturesque little chains; the ground was strewn with boulders; the peaty soil and the stunted vegetation resembled subantarctic heaths (Fig. 18). A small stream cut through the fern beds. I thrust aside the coarse ferns to quench my thirst. Then suddenly stopped. For over the dewy moss trailed the tiny subantarctic bramble (*Rubus geoides*), and close by crawled the runners of the common subantarctic club moss (*Lycopodium magellanicum*). And there were the delicate rosettes of one of the dwarf mountain asters of the south (*Lagenophora*) and others which certainly had no right to exist in the latitude of Valparaiso (33°). I felt I had a reason to congratulate myself, for thus was made the discovery of the Magellanic flora in the Juan Fernandez Islands.

My companion and I made a hasty survey of the neighborhood. There was no time for serious work, the day was drawing to its close, and al

¹ The name Juan Fernandez is applied both to the chief island, Mas-a-tierra, and to the group as a whole.

² Federico Johow: Estudios sobre la Flora de las Islas de Juan Fernandez, Santiago, 1896.

material gathered was further restricted by the seasonal limitations: up here the winter rest is marked. But when I bade farewell to the summits

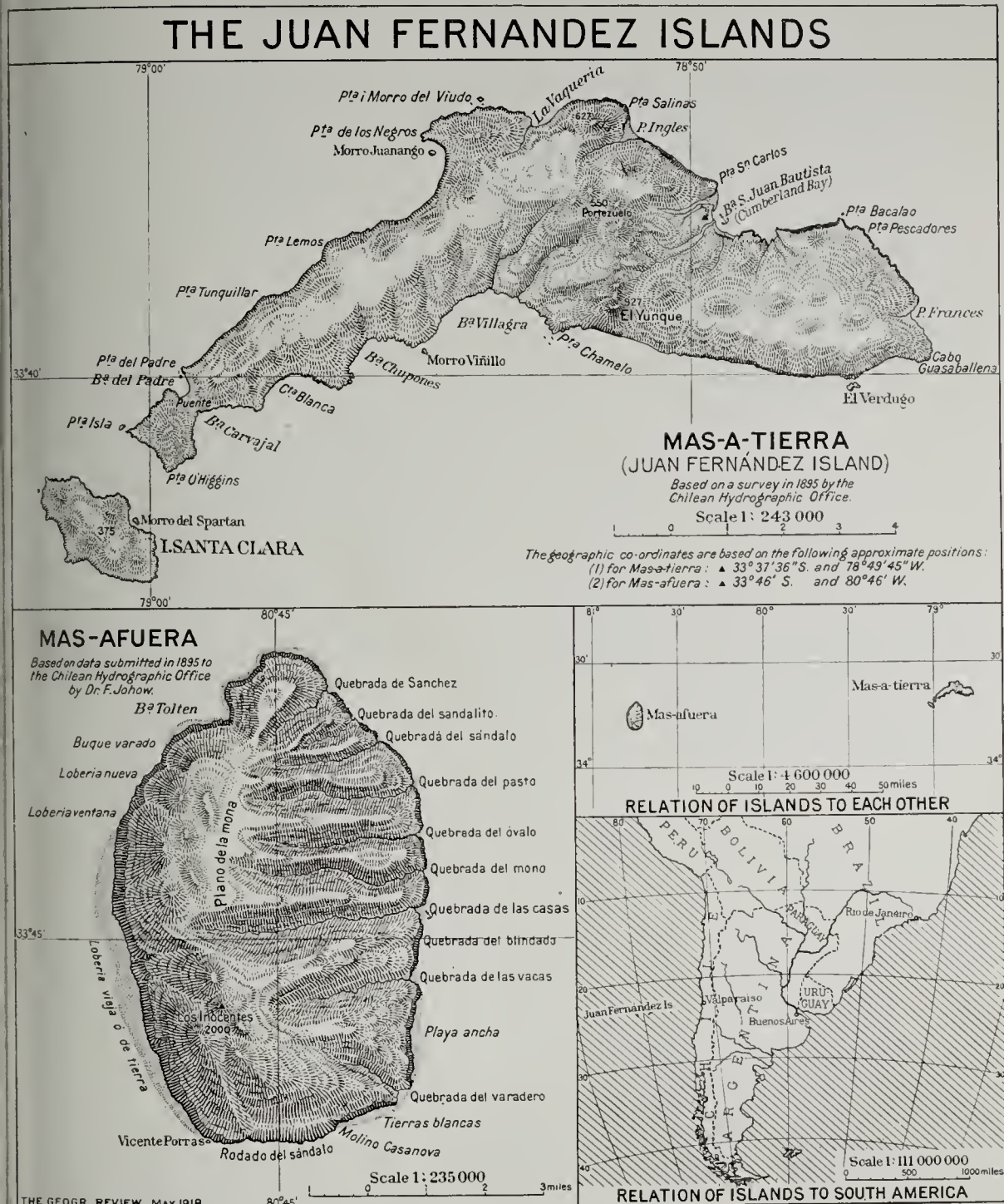


FIG. 1.—Maps of the Juan Fernandez Islands: Mas-a-tierra, 1:243,000; Mas-afuera, 1:235,000. The authorities are cited in each case. Heights in meters.

of Mas-afuera I had already made up my mind to come back to camp at the little stream and force the island to yield its hidden treasures.³ My

³ Carl Skottsberg: *The Wilds of Patagonia*, London, 1911 (see Chapter 9). On the Magellanic flora see the author's article "Distribution of Vegetation in the Colder South Hemisphere," *Imer*, Vol. 25, 1905, pp. 402-427, and the reports of the Swedish Antarctic Expedition, 1901-03, especially his: *Pflanzenphysiologie des Feuerlandes*, *Wiss. Ergeb. der Schwedischen Südpolar-Expedition, 1901-1903* (Stockholm, various dates), Vol. 4, Part 9; *Das Pflanzenleben der Falklandinseln*, *ibid.*, Vol. 4, Part 10; *The Vegetation in South Georgia*, *ibid.*, Vol. 4, Part 12; *Die Vegetationsverhältnisse des Graham Landes*, *ibid.*, Vol. 4, Part 13.





FIG. 3.—The Anson valley, sloping toward Cumberland Bay, Mas-a-tierra. In the right background the massif of El Yunque. The slopes in the foreground are barren; those in the middle distance are covered with forest patches.

botanical results proved to have a remarkable interest. The large percentage of endemic and often highly peculiar forms characterizing the islands raises questions of a general nature. Problems of the physical history of the Pacific Ocean, its islands, and the South American mainland are involved, as well as that of the great plant and animal migrations that have taken place in this part of the world. The data accumulated in the short time available in 1908⁴ needed amplification.

SWEDISH PACIFIC EXPEDITION

The new enterprise, known as the Swedish Pacific Expedition of 1916-17, was supported by the Royal Geographical Society of Stockholm and by a number of government institutions. Its aim was announced as "an attempt to carry out as complete a biological investigation of the outlying Chilean islands as possible, especially of Juan Fernandez." We left Sweden on October 4, 1916. Mrs. Inga Skottsberg was attached as botanical assistant, and I was further accompanied by Mr. K. Bäckström, who made zoölogical collections.

The Juan Fernandez group consists of two larger islands, Mas-a-tierra, 360 miles west by south of Valparaiso, and Mas-afuera, 90 miles farther west. Mas-a-tierra is about 12 miles long by $3\frac{2}{3}$ wide, Mas-afuera 6 by $3\frac{1}{2}$. At the southwest end of the former and separated from it by a shallow channel is the small and desolate islet of Santa Clara (see map, Fig. 1).

For many years after their discovery the islands were only occupied temporarily. In the mid-eighteenth century, to prevent their use as a rendezvous for pirates or as a provisioning station for other more formidable enemies, the Chilean governor created the first permanent settlement in Mas-a-tierra on the bay of San Juan Bautista, better known as Cumberland Bay (Fig. 8). The fortunes of the settlement fluctuated. On several occasions the island served as a penal station. Agricultural enterprises had little success. Today it enjoys a certain prosperity as the center of a flourishing fishing industry. The waters are rich in excellent fish, many species being peculiar to the place; yet this abundant variety is of minor importance. The colony, including some 300 souls, may be said to subsist on one single product, a large crustacean (*Palinurus frontalis*), known only on these islands and on the sterile islands of San Felix and San Ambrosio 500 miles farther north, where no settlement is practicable. This lobster is highly appreciated in Chile. Two canning factories have been established here, and three schooners carry the canned product as well as great quantities of live lobsters to the mainland. Nearly all the fishermen have their gardens, where fruit and vegetables are grown, and small herds of cattle graze in the well-watered valleys.

The expedition arrived in Mas-a-tierra on December 1, 1916, and

⁴ The scientific results were published in the *K. Svenska Vetenskapsakad. Handl.*, 1910-1916: Part III (1914) deals with Juan Fernandez, Parts IV (1913) and V (1916) with the Andean and Magellanic floras.

remained until April 30, 1917. A laboratory was established in the colony, where we maintained our headquarters. February and the greater part of March were dedicated to the survey of Mas-afuera. Mr. Bäckström returned to Mas-a-tierra in July and spent a month there studying the winter fauna. All research work had to be done on foot. Three narrow and miserable cattle trails lead from Cumberland Bay to other parts, and it is possible to follow them on horseback, at least in the drier season; but some passages make the rider hold his breath and wish himself safe on the other side. The higher parts of the island can be reached only by following the narrow ridges that descend to the sea. Along these ridges, crowned by an outcrop of basaltic rock, are the old goat paths, many still visible in spite of the scarcity of these animals in later years. Goats apparently do not hesitate to use the most dangerous passages, but the traveler will sometimes hesitate to follow their trail. This explains why our survey yielded good results. The younger fishermen are daring climbers and stop at nothing in their pursuit of the goats or the *chonta* palm, which is much sought after for its wood. Occasionally they contributed to our knowledge of natural history, and one of them, Pedro Gutierrez, who was a great help to us from the first, later became a member of the expedition to Mas-afuera.

THE ISLAND OF MAS-A-TIERRA

All the islands are built of Tertiary volcanic rocks, nearly always beautifully layered. It is probable that they are early Tertiary: there is no trace of craters or of any recent volcanic action. The topography of Mas-a-tierra is very broken (Fig. 3). The eastern part is much the higher. It reaches its greatest elevation along the south side, culminating in the famous and truly inaccessible massif El Yunque (The Anvil), which falls abruptly down into the sea 3,100 feet. The upper part is of a hard, dark gray rock forming all the wild crests and peaks. The island has been greatly cut down by erosion, which has left a curved backbone and a long line of ribs separating deep valleys. Underlying the harder rocks are innumerable layers of tufa, red, brown, or yellow, that make a striking contrast to the vivid green of the forests. The rainfall is concentrated on the higher eastern and central portions of the island, where the air currents, rising suddenly from the south shore, condense their moisture. From the high backbone forest-clad valleys descend to the north coast and terminate in open bays. No level ground of any extent is seen; a tract like that shown in Figure 8 is a rare exception. Between the bays the shore is very steep, and the cliffs reach the height of a thousand feet in many places (Fig. 2).

The southwestern portion of the island, of which Santa Clara is a continuation, has a rather different appearance. The upper layers are upraised and form a high ridge along the northern margin, where the shores are precipitous. The valleys run in a southerly direction and do not reach the water; their streams are dry for several months. Accordingly, arborescent



Arundo donax, whose leaves attain man-size.

vegetation is entirely wanting, and for miles the ground is covered with grasses and herbs. Only the climate of the central part (Cumberland Bay) is well known. Here observations have been made many years. It shows a combination of comparatively high temperature and considerable rainfall not found on the coast of Chile.⁵ The temperature is extremely agreeable; the summer is never very hot; and the winter is always mild, frost being unknown. Gales are frequent, and local winds rush down from the precipices and sweep through the valleys with tremendous force. A thick wet fog hangs round the summits even in the drier season, and the character of the vegetation further indicates that the climate of the higher portions is colder and wetter. The southwestern peninsula with Santa Clara has a different climate from the rest. It is and has always been destitute of trees.

A FOREST TRIP

In order to make the reader acquainted with the peculiar nature of Mas-a-tierra I shall now offer to be his guide on a trip through its forests and along its picturesque cliffs; but special note must be made of its different types of vegetation, for it is plant life more than anything else that puts its stamp on the scenery. Let us remember Darwin's saying: "A traveler should be a botanist."

In the valleys near the sea work is easy. The soil lies bare, the forest has been destroyed, erosion is very active. There one of the introduced Chilean weeds has won a considerable victory, thanks to its most efficient means of dispersal; it is a burnet, *Acaena argentea*. Cattle and sheep become covered with its fruits and carry them everywhere. From the lower hilly tracts we soon pass into low, pitch-dark thickets, formed by another stranger, the Chilean *Aristotelia maqui*, introduced some sixty years ago. It is able to germinate and grow in the deepest shadow, it sprouts from the base of its stem with amazing speed, and it has entered and conquered all the lower parts of the valleys. The berries are the staple food of the thrush, which sows it in thousands every year. To the native flora it has become a serious menace. Its vanguard has already reached the highest ridges. If nothing is done to check the formidable invader, much of the precious native flora is doomed.

At a height of 600 or 700 feet the forest still retains much of its original character, and many places remote from the colony are quite primeval. It is an evergreen rain-forest, much resembling, in general appearance, that of southern Chile. Several species are identical with those of Chile, others belong to Chilean genera, represented by endemic species. The commonest

⁵ A summary of meteorological records of Chile is given and analyzed by R. C. Mossman: *The Climate of Chile, Journ. Scottish Meteorol. Soc.*, Vol. 15, 1911, pp. 313-346. For the first half-decade of this century the principal observations at Juan Fernandez show:—mean monthly temperature, February, 66.9° F.; August, 54° F.; absolute minimum, 38.8° F.; prevalent winds (blowing on 70 per cent of the observations), south-east to southwest; mean annual rainfall, 40.5 inches, of which 80 per cent falls from April to September. To find such a degree of rainfall on the Chilean coast one must pass to a considerably higher latitude.

is a myrtle tree, *Myrceugenia fernandeziana*, with a smooth light-gray bark and a beautiful lustrous dark foliage, in early summer covered with innumerable white, fragrant flowers. The soil is strewn with fallen trunks, covered by a rich carpet of mosses. Ferns are plentiful; there are large and handsome forms, as well as minute, of the elegant *Hymenophylla*. Curiously enough, phanerogamic climbers are wanting; they are replaced by ferns with winding rhizomes reaching high up on the trunks of the trees and forming a most attractive and striking picture.

NOTEWORTHY SPECIES

One of the most famous trees is a palm, *Juania australis*, a monotypical endemic genus, called *chonta* by the inhabitants (Fig. 4). It is now rare in the accessible valleys, for it has been sought and cut with great persistence on account of its handsome wood. True, cutting it is strictly prohibited, but the law is not rigidly enforced: not a vessel leaves the island without carrying away some of this wood. The *chonta* has its nearest relatives in tropical America but has no relation with the Chilean palm growing just opposite on the mainland. There are several other trees and shrubs altogether strange to the flora of Chile, or even to that of South America.

The forest flora of Juan Fernandez has suffered at least one great loss since man first settled there. The reader who knows the early history of the Spanish possessions will perhaps remember that the islands once were famous for their precious, perfumed sandalwood. So complete was the destruction of this remarkable tree that the first complete botanical description was written merely from twigs of the last specimen—and that as late as 1896! For almost a hundred years it had been sought in vain. I shall never forget my journey to pay homage to this tree in 1908. It was destroyed some years ago, and thus *Santalum fernandezianum* disappeared from the world. The genus is unknown in America, it is West Pacific and Indian, save for this single species blotted out by thoughtless man.

THE HIGHER VEGETATION

But let us hasten to the higher slopes and the mountain forest. We have entered the fog belt, where there is more moisture and less heat.⁶ Even the ordinary traveler would note the change in vegetation. Many new species appear. Ferns become plentiful, and some are very striking. One is a proud tree-fern, *Dicksonia Berteroana* (Fig. 6), whose nearest relative is a species in Fiji. Another is the *Thyrsopteris elegans*, with leaves as long as 12 or 15 feet, having doubtful relations back in pre-Tertiary time but none in the present! Fine epiphytic ferns and large festoons of hanging moss

⁶ In order to gain some knowledge of the weather here we set up some instruments in the Portezuelo pass (Selkirk's "Lookout," where the memorial tablet was erected in 1868) and made observations every two days for some little time. But we had to climb 1,850 feet to read the instruments.



FIG. 6.



FIG. 7.

FIG. 6—Virgin forest on Mas-a-tierra, with tree-ferns (*Dicksonia Berteroana*).
 FIG. 7—*Robinsonia thurifera*, one of the rarest plants of Mas-a-tierra.

cover the trees. This is the region where one of the rarest and most peculiar dwellers of Mas-a-tierra is found: *Lactoris fernandeziana*, forming the monotypical family Lactoridaceae. It stands somewhere near the magnolias and offers the only instance known of a natural order confined to an oceanic island.

At the bottom of every *quebrada* (Fig. 5) a small waterfall is generally encountered, where a stately twig rush (*Cladium scirpoideum*) hangs down over the dripping wet rocks. Round the brook an endemic *pangue* (*Gunnera peltata*) unfolds its gigantic leaves, borne on a stem many feet high. The special tree of the valley bottoms is a stout *Boehmeria*, of the nettle family, with distant tropical relations.

An excursion through the forest is easily described, but not so easily made. The sides of the valleys are very steep, especially when approaching the ridge. The soil is soaked with moisture and often gives way under foot. Only with the aid of the trunks and roots can ascent of these ridges be made, save in the few places where a path has been cleared, winding in sharp turns along a slope often as steep as 30° or 40° . Many places are impenetrable thickets of ferns, brushwood, and bamboo, so that it costs some labor to gain the stony ridge.

Figure 9 will give a good idea of one of the ridges. The limit of the forest is clearly visible. This is not a climatic limit. The soil is very thin or entirely wanting; vegetation is confined to crevices and narrow ledges and thus is naturally broken up. Moreover the ridge is dry in summer and very much exposed to the gales. Dense thickets of xerophytic shrubs, rigid ferns, and patches of hard grass are often encountered.

MINIATURE TREES

Along the upper limit of the closed forest, where light is strong, we meet with the host of plants which have helped to make these islands famous among botanists. They are peculiar miniature trees, belonging to endemic genera or at least species of various families, Compositae being most common. They have a simple or dichotomously branched stem, and the leaves are crowded at the end of the branches. Here are large woody *Eryngia*, a plantain tree, the rare *Selkirkia* (forget-me-not family), and several species of *Dendroseris*, *Robinsonia*, and other Compositae (Figure 7 is a good example). They constitute a perfect living museum of ancient types, either without relations or connected only with distant Pacific islands, thousands of miles away.

The view from the higher parts—and east of El Yunque a summit of 2,500 feet is reached without much difficulty—is truly magnificent. All around run the rocky ridges, sometimes as sharp as a knife edge and as steep as a wall, sometimes barren, sometimes heavily clad with ferns and mountain *pangues*; high, dominating peaks rise with a defiant air over richly carpeted slopes, brilliant with many flowers. Everywhere valleys



FIG. 8.



FIG. 9.

FIG. 8—Cumberland Bay, Mas-a-tierra.

FIG. 9—A typical rocky ridge on Mas-a-tierra. The limit of forest is not due to altitude but to absence of soil.

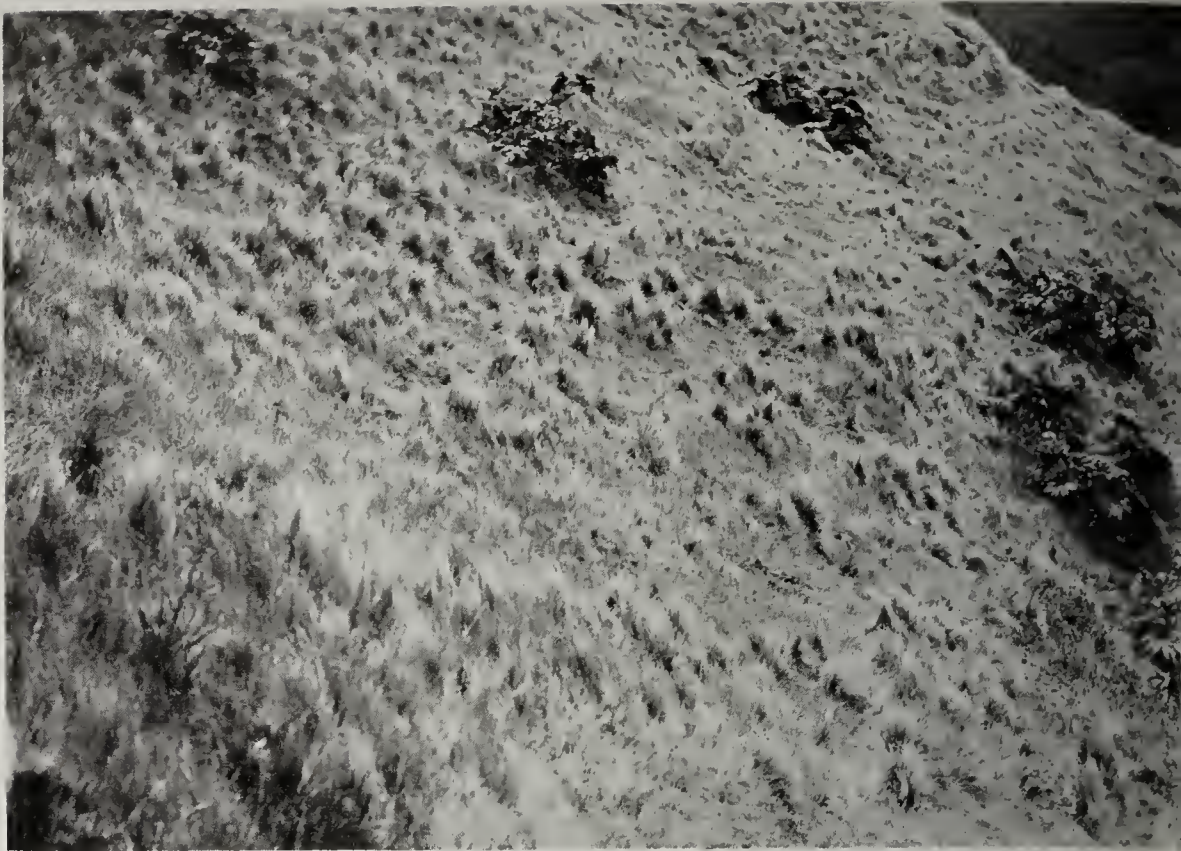


FIG. 10.



FIG. 11.

FIG. 10—Steppe vegetation in Mas-a-tierra. Small patches of *Gumera*.

FIG. 11—*Dendroseris macrophylla* on Santa Clara. A miniature tree representing an ancient type. The leaves are glaucous, the flower-heads bright orange.

seem to descend, their bottoms hidden under luxuriant growth. *Chontas* raise their shapely heads above the green roof, waving in a fresh breeze that now and then uncovers a cluster of the scarlet berries. Down below follow the barren slopes, bright with the colors of the earth and suddenly falling away in precipitous cliffs, washed by the eternal surf. The wind brings the sound of the roaring breakers, but here as faint as the humming of a swarm of bees. With a little geographical training the physiographical history of the island is easily read. Not so plain is its story for the biologist. He faces a number of difficult problems, and like difficulties confront the zoölogist. The fauna, at first, does not seem to be very rich. There are no indigenous mammals, and, save for sea birds, winged life is poor in species. The most remarkable bird is a hummingbird (*Eustephanus fernandensis*), famous among ornithologists on account of the sexual difference. However, of lower animals a great many are found, such as land molluses, insects, and spiders, and many of them are endemic.

The barren western parts of Mas-a-tierra are of less interest. Weeds, from Chile or Europe, are very abundant, quite obscuring the original vegetation, of which but small areas like that in Figure 10 remain. On Santa Clara fresh water is altogether wanting. In crevices of the high coast cliffs some good specimens of *Dendroseris*, of two species, do fairly well. A rock close to Santa Clara, separated from it only at high tide, offers a most striking picture with the numerous *Dendroseris* trees, *D. macrophylla* prevailing (Fig. 11).

THE ISLAND OF MAS-AFUERA

The island of Mas-afuera, mentioned in the opening paragraph, is distinctly inaccessible. In 1909 the Chilean Government established a penal settlement here, and more or less ruinous buildings may be seen in many places. Expensive landing arrangements were made, but since the place was abandoned, in 1913, they have become completely destroyed. There is no harbor and no safe anchorage anywhere. The surf often makes landing impossible; it is always more or less precarious, so that the assistance of skilled hands is necessary. We had chartered a schooner to take us there, but our first attempt was fruitless and we lost a week. The second, however, was successful, and we landed our impedimenta without damage. The settlement was situated at the mouth of the Quebrada de las Casas. We made ourselves as comfortable as possible in the best house of the now uninhabited island.

DIFFICULTIES OF ACCESS

Mas-afuera has a rather striking appearance. It is a solid rectangular block of sheeted lava, on all sides terminating in perpendicular cliffs. For the most part a narrow strip of boulders along the beach permits a passage round and makes it possible to enter all the valleys which reach the sea. The west side is much higher than the east, and all along that side there is a



FIG. 12.—The upland surface of Mas-a-tierra, its eastern border dissected by numerous rectilinear canyons (see map, FIG. 11).



FIG. 13.—Forest patch in a Mas-afueran valley. The forest on this island is confined to the middle levels of the valleys (1,000-2,200 feet), the limits, in contrast with Mas-a-tierra, being climatic. Above is a meadow and alpine zone; below a luxuriant fern vegetation flourishes.

sheer drop of four to five thousand feet. From the longitudinal ridge a great number of canyons radiate to the northeast and southeast (Fig. 12). Their heads are usually occupied by high waterfalls, often nearly dry in summer (Fig. 14). Some of these canyons, in the relative dimensions of depth and width of bottom, hardly have their equals anywhere. A good example is shown in Figure 17. There is practically no margin between the stream and the perpendicular wall. Small waterfalls and heaps of huge boulders must be passed in order to enter; it may even be impossible to enter at all. Fresh pieces of rock, fallen down from the height of some two or three thousand feet, show that the place is not absolutely safe. The two central valleys, which drain the highest and rainiest part, have cut back into the island so far and so deep as nearly to divide it in two. These two valleys, Casas and Vacas, are separated by a high and narrow ridge so steep that its sides cannot be climbed. But near the sea a trail, cut by the convicts, leads up on the ridge, and from there a goats' track leads all round the end of the Casas valley to the northern half of the highland where two summits reach 4,700 feet. This promenade is one to be recommended. It is a little tiresome and, of course, should not be tried by anybody likely to get dizzy, for in several places there is just sufficient space for your feet, if they be not too large, and on both sides you look down into a canyon with a winding silver streak glittering below you—there is a chance for a clean fall of two or three thousand feet on either side. The southern portion of the upland cannot be reached in the same convenient manner, for it is impossible to climb along the head wall of the Vacas canyon, even for the goats I believe. Just beyond is the highest summit, most inappropriately called Los Inocentes. It can only be reached from two places near the sea; the easiest is the south wall of the Vacas canyon (Fig. 15). The ascent is not without danger, for the slope is covered with very slippery grass and loose stones. Shoes should not be used, and the nearly lost faculty of grasping with the toes should be exercised if possible. Our first attempt, made from the southeast corner of the island, a very dangerous place, was frustrated after we had got over the worst part, for we met a mile-wide and impenetrable forest of fern trees and came into a thick fog. Later we started from a point just south of the Vacas valley and had complete success. We found the top to be 5,300 feet high, a considerable figure in comparison with the small size of the island.

ITS VEGETATION

We have no exact knowledge of the climate. It is not greatly different from that in Mas-a-tierra, for many vegetable products are the same. But of course, there is nothing in Mas-a-tierra to match the high upland of Mas-afuera. Residents in the penal colony have reported that it not seldom appears white with frost in winter. The coast cliffs and lower slopes are dry and warm and have a steppe vegetation.



FIG. 14.



FIG. 15.

FIG. 14—Head wall of a deep canyon on the eastern side of Mas-afuera.

FIG. 15—The entrance of the Quebrada de las Vacas, Mas-afuera. Boulder beach in the foreground. The ascent is made up the gully on the left and then along the south (left) wall of the canyon.

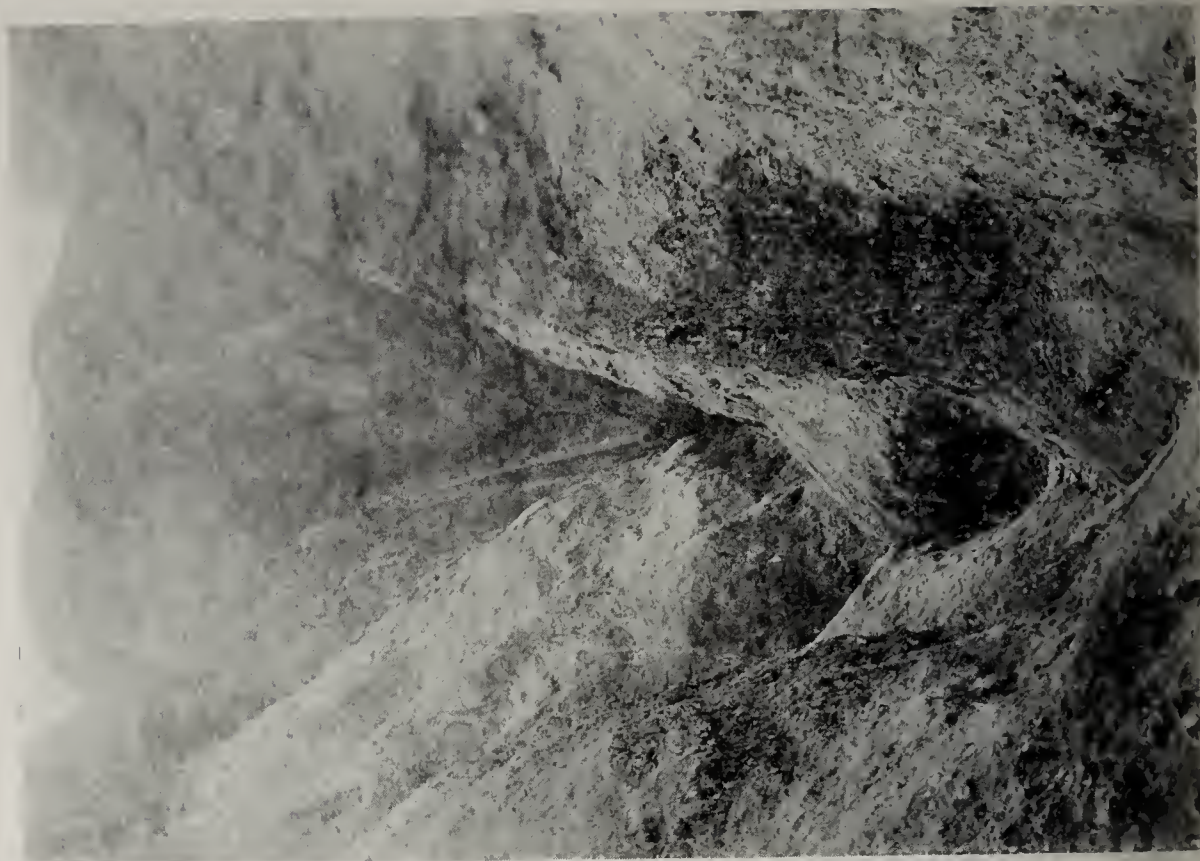


FIG. 15. Typical canyon in Mas afuera. Some of the canyons are as steep as their equals in steepness anywhere.



FIG. 16. The steep western side of Mas afuera, falling away 4,000 or 5,000 feet to the sea.

The forest is confined to the middle part of the valley systems, forming an interrupted belt between 1,000 and 2,200 feet above sea level. Figure 13 gives a good idea of this forest. It is largely composed of an endemic myrtle tree (*Myrceugenia Schultzei*). Beautiful groves of *Dicksonia* fill the damp corners. Along the upper parts of the forest and ranging up into the next region are a number of miniature trees of the *Robinsonia* type, some only found on this island and now made known for the first time. The forest limit here is a climatic one, probably a matter of summer temperature. Above this line we enter the foggy region, covered by extensive meadows and vast beds of ferns. To this region belongs the marvelous pure *Dicksonia* forest around Los Inocentes. The meadows must have been quite different before the arrival of man, for they are invariably formed in the main of two European plants.

ITS WILD SCENERY

Above 3,500 feet the scenery grows more and more alpine in character. Mas-afuera has a really alpine region, notable for its Magellanic flora. It is not a question of the miraculous arrival of some stray species from the far south: it is a whole flora, forming natural associations, with mosses, lichens, ferns, and flowering plants. The nature of the locality is shown in Figure 19.

There is a first-rate surprise in store for the traveler when he reaches the upland and strolls across toward its western border. There he suddenly stops—and he is wise in doing so, for at his feet opens an abyss (Fig. 16). Four or five thousand feet below him the breakers come rolling in; cliffs are cut and torn to the most incredible shapes; there are perfect combs, overhanging shelves, oblique needles, ready to fall. It is wild scenery indeed and may fairly be compared to the hell of Dante as pictured by Doré.

Let us hasten down into one of the canyons, where there is rest and peace. It is nature's own greenhouse. What a variety of beautiful ferns! What life on every ledge, in every corner where soil is to be found. Along the stream are imposing groups of a fine *Gunnera*, discovered by me in 1908, and endemic in this island. Its leaves measure as much as 10 feet across (Fig. 20). The stalks are edible and refreshing, with a slightly acid taste.

FLORAL ELEMENTS NEEDING EXPLANATION

Such are the Juan Fernandez Islands. As soon as our collections have been studied full account of our results will be given. I shall try to explain the origins of this quaint life. There is one decidedly Chilean element, related to the flora of Valdivia, but the occurrence of Chilean types is not surprising. Then there is the Magellanic, or subantarctic, element, not represented in Mas-a-tierra. It may have immigrated at a time when it had a wider range on the continent, as was the case during the Glacial Epoch. There is, further, a small tropical element without relations to the



FIG. 18.



FIG. 19.

FIG. 18—The upland on Mas-afuera where the first Magellanic plants were discovered in 1908.
FIG. 19—Alpine scenery on the upland of Mas-afuera.

present flora of Chile. But this country once had a tropical flora. There was no high eordillera separating it from the rest of the continent at that time. Unfortunately, our knowledge of this flora is very small.

Finally, there is the very special element, the strange-looking endemic plants which either have no relations at all or give doubtful hints towards



FIG. 20—*Gunnera Mas-afuerae* in the Quebrada de la Casas, Mas-afuera. The leaves sometimes measure as much as 10 feet across. See also Fig. 5.

distant parts of the immense Pacific Ocean. Did they come across the vast waters from many lands and become transformed into new species and genera, while their ancestors disappeared altogether? The very slow rate of evolution negatives this theory. Possibly they, together with others in other islands, form the scattered remains of an ancient Pacific flora, of which the bulk has perished. But where did they come from? Was there a continent, a group of larger islands? Was Juan Fernandez once a part of something, of some mysterious land? I shall only point to one fact. Our islands are situated on a deep submarine ridge, which can be followed north to San Felix and San Ambrosio. These latter islands have a very different climate, but they have, nevertheless, some ancient endemic plants. Unfortunately, it was not possible for us to visit this place, as no transportation facilities could be obtained from the Chilean government.

THE GROWTH OF AMERICAN CITIES

By LAWRENCE V. ROTH

This study places the larger American cities in four geographical groups: those belonging to the Atlantic Coast, the Mississippi Valley, the Great Lakes region, and the Pacific Coast. They may also be grouped in chronological periods as hereafter outlined. With the French school of geographers we may distinguish between *site* and *situation* as factors influential in locating and developing urban centers.¹ The *site* of a city is determined by local conditions, such as the nature of the ground, water supply, and accessibility to the building materials and food needed by a growing community. These factors Professor Blanchard calls *éléments de fixation*. The present treatment deals rather with the general situation of the city in relation to routes of communication and the natural resources of its hinterland.

Periods of Growth

The growth of cities in the United States has passed through four periods, each of which in its turn was the response to the commercial and industrial development of a new geographical region. The first steps in city development appear in early colonial days with the increasing use of natural resources and the exchange of goods with the mother country, her colonies, and various nations of Europe. The second period, whose activity centered in the lower half of the Mississippi Valley, began about 1810 and reached its culmination about 1850. Flatboats and, later, steam craft carried the products of the soil on the western waters. The consequent expansion of trade and the movement of the population across the Appalachian barrier gave swift growth to the cities of the region. Within this period some Atlantic Coast ports grew more rapidly than the cities of the Mississippi Valley. Urban centers of the Great Lakes region developed rapidly about 1850 but reached their most significant growth after 1880. The expansion of the railroad system westward along the lake plains and the navigation of the lake waters were important factors in the growth of these cities. These means stimulated the movement of people into the lake plains province. The fourth and latest period of large city making consequent on the development of a new region belongs to the Pacific Coast and becomes significant after 1900. The constant westward migration of population promoted by the building of the transcontinental railways, the marketing of the native resources, trade with Alaska and the Orient, and

¹ This view has been elaborated by Professor Raoul Blanchard of the University of Grenoble, Visiting Professor in Harvard University, 1917.

favorable climate are the factors which have contributed to the concentrations of population on the Pacific Coast.

GRAPHICAL COMPARISON

The first twenty-one cities in population *rank* are chosen to show this urban movement. Figure 1 does not show actual population² but changes in *rank* regardless of the number of inhabitants. The exhibit is by decades from 1790 to 1910 with the interval 1910 to 1917 added. Figure 2 shows the actual population growth of the largest of these cities for the same period. On Figure 3 are composite lines representing the four largest cities of each group.

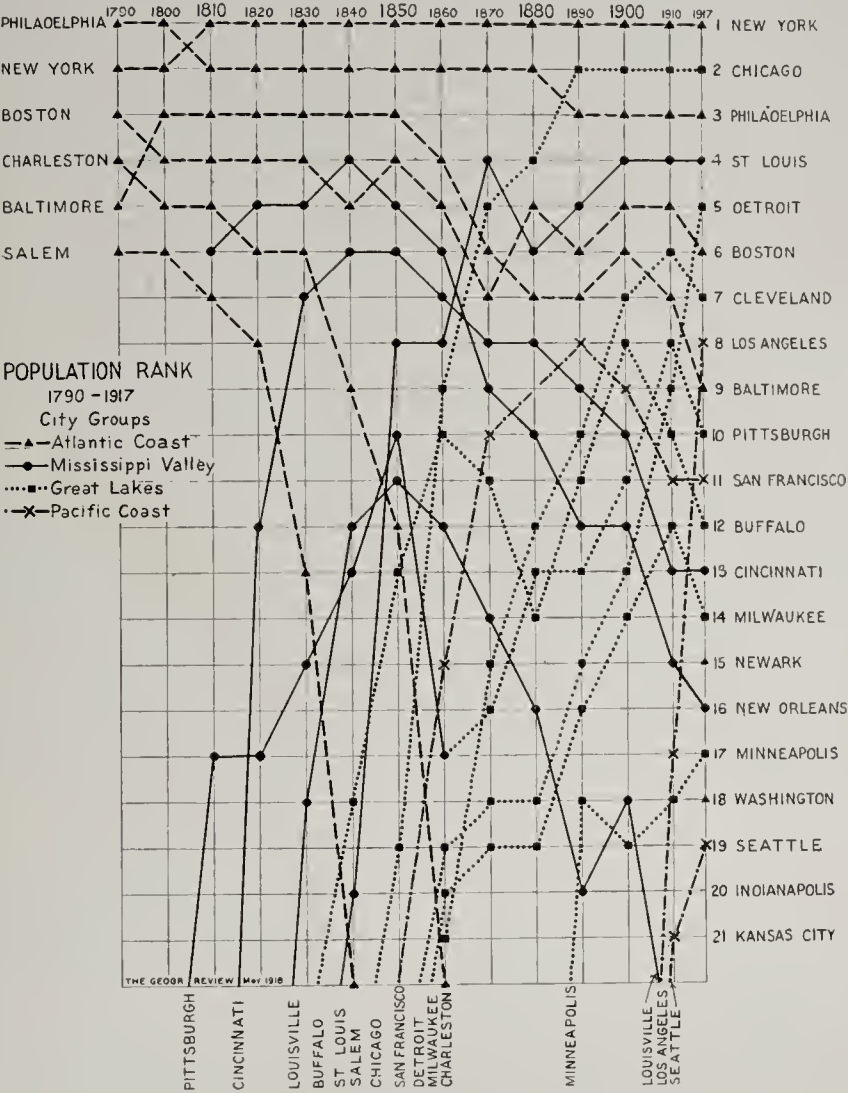


FIG. 1—Diagram showing rise and fall in municipal population rank of the twenty-one largest American cities according to region from 1790 to 1917.

shows these centers of the Mississippi Valley rising sharply from 1810 to 1850. It also reveals a corresponding fall in rank of two Atlantic Coast cities, Charleston and Salem. After 1850 all the river cities except St. Louis are descending in rank, while the Great Lakes cities rise into prominence. Two cities of the Atlantic Coast, Baltimore and Boston, yield their rank to a river city, St. Louis, and a lake city, Chicago. On Figure 2, showing actual population growth, New York and Philadelphia in 1850

² The graphs are based on the United States Census reports from 1790 to 1910 and on various municipal publications. In every case they represent municipal and not metropolitan statistics.

are much in the lead. Baltimore and Boston still rank third and fourth. Then come four river cities, New Orleans, Cincinnati, St. Louis, and Pittsburgh. The lake cities show a slight ascent after 1850, while San Francisco and Los Angeles appear on the Pacific Coast. Figure 3 shows the Atlantic Coast group far in the ascendant and rising sharply after that date. The slight rise of the river line, which in 1850 is second, is entirely due to the rapid growth of St. Louis. After this date the lake line makes an ascent, and the line for the Pacific Coast has its beginning.

THIRD PERIOD

The decades from 1880 to 1900 are the most important for the growth of the lake cities. Figure 1 shows every lake line rising dur-

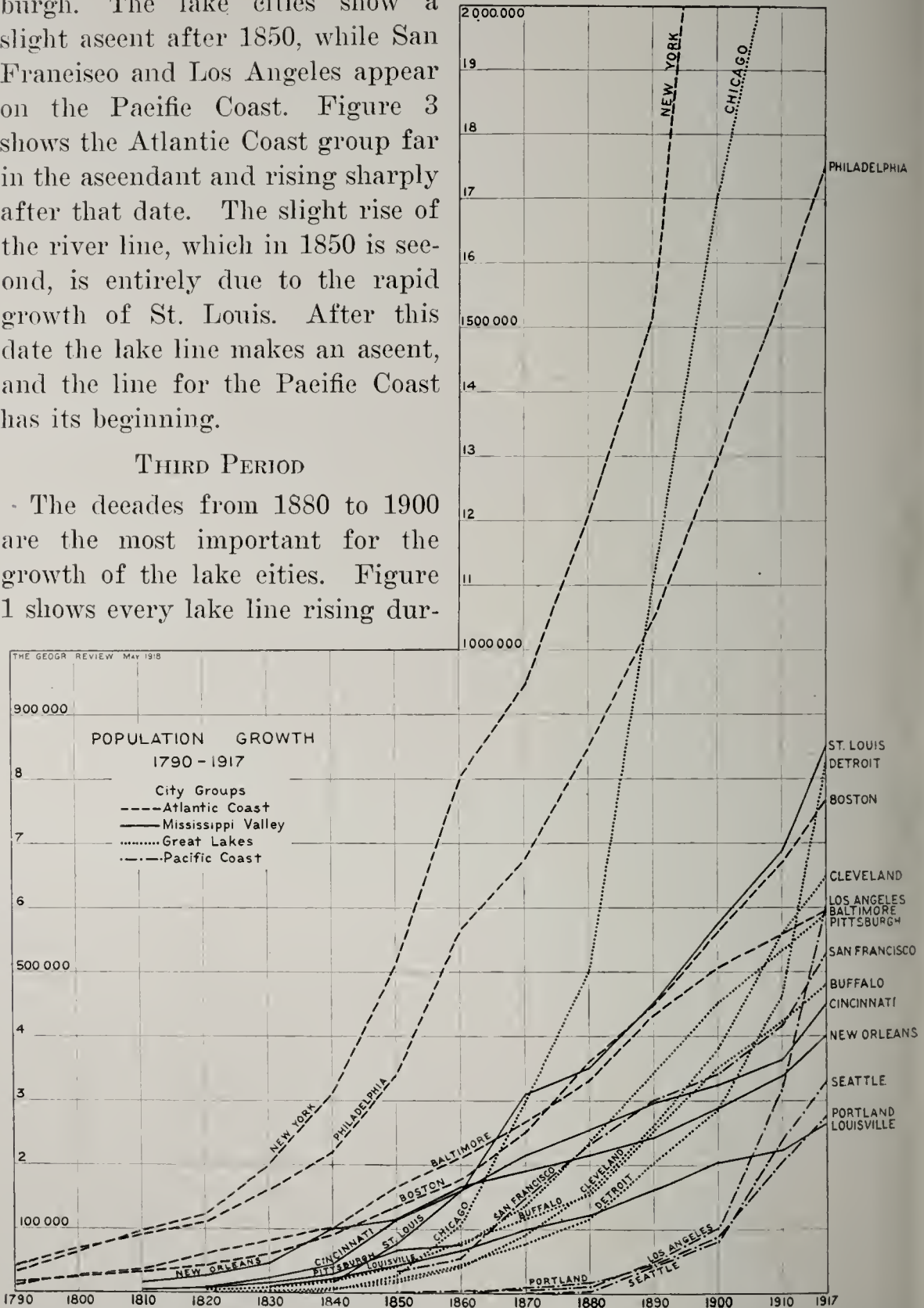


FIG. 2—Diagram showing actual population growth of the largest American cities according to region from 1790 to 1917.

ing these twenty years, while all the river lines save that of St. Louis are falling. On the Atlantic Coast Philadelphia yields to Chicago, and Boston

loses its fifth rank to St. Louis. The most significant movement indicated on Figure 2 is the growth of the cities of the Great Lakes. Apart from the more rapid development of St. Louis the river cities show a moderate growth from 1860 to the present time. Figure 3 shows the cities of the Atlantic Coast still in the lead in 1880, but the river cities give way to those of the lakes after that date.

FOURTH PERIOD

In the period from 1900 to 1917,³ as Figure 1 shows, the first four cities, New York, Chicago, Philadelphia, and St. Louis, maintain their respective rank. The most significant change, however, is the growth of Los Angeles and Seattle on the Pacific Coast. San Francisco holds eleventh rank from 1910 to 1917. As a center of population, however, the San Francisco district ranks seventh while Los Angeles ranks fourteenth. This movement has caused a corresponding fall in rank of certain lake cities, especially Buffalo and Pittsburgh.⁴ Another remarkable change of rank shown on Figure 1 is the rise of Detroit to fifth place, above Boston and Cleveland. Boston, however, by reason of the density of population in its surrounding area is the fourth metropolitan center.⁵

Figure 2 pictures the same urban movement. The growth of New York, if shown to 1917, would require a diagram on a different scale. The sharp ascent of its line after 1890 is largely due to the absorption of Brook-

lyn and other municipalities in 1898. A most significant change is in the growth of the Pacific Coast cities after the year 1900.

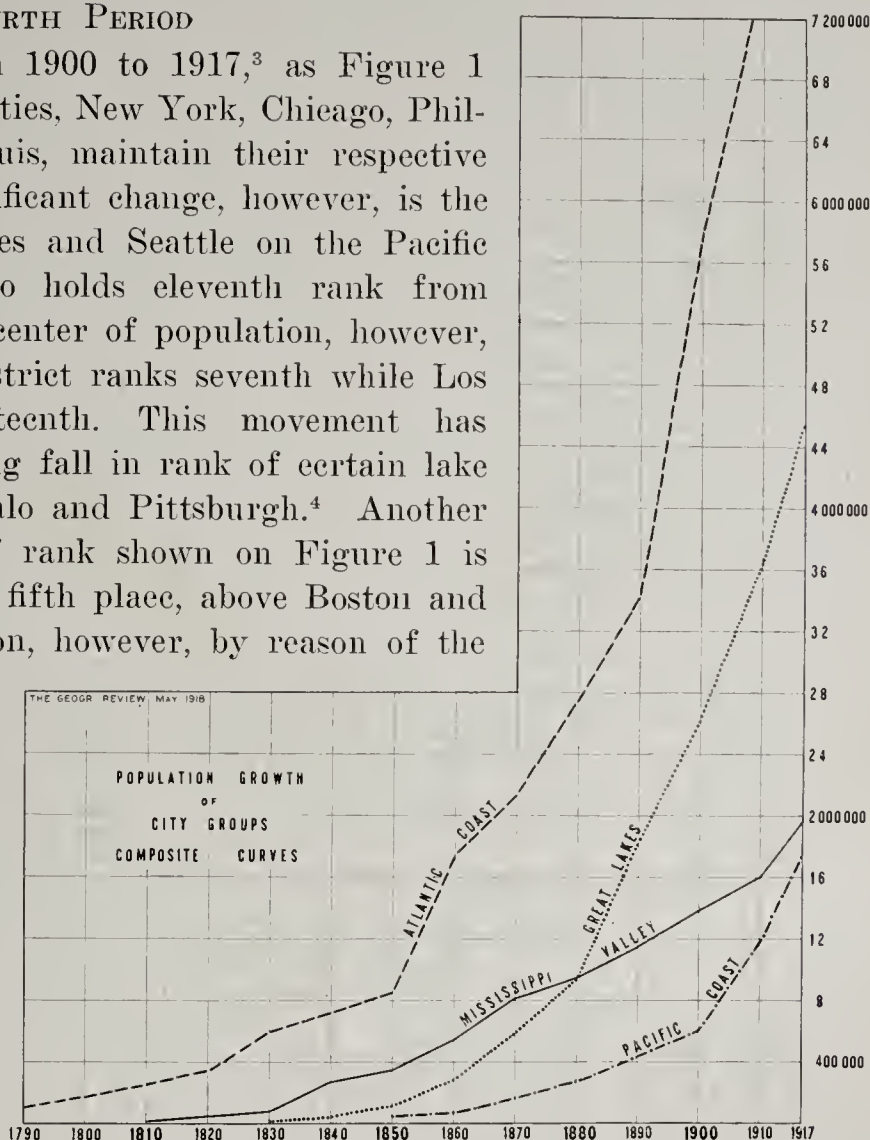


FIG. 3—Composite curves showing the municipal population growth of the four largest American cities in each of the four regions from 1790 to 1917 (Atlantic Coast: New York, Philadelphia, Boston, and Baltimore; Mississippi Valley: St. Louis, Cincinnati, New Orleans, and Louisville; Great Lakes: Chicago, Detroit, Cleveland, and Buffalo; Pacific Coast: Los Angeles, San Francisco, Seattle, and Portland).

³ The author is aware that metropolitan statistics offer a fairer basis for comparison than those of municipalities. The object of this paper, however, is to treat urban centers regionally rather than individually. The metropolitan figures would change the rank list as shown on Figure 1, but they would not materially affect the general movement of the lines.

⁴ The latter counted as a lake city after 1860. See below.

⁵ Mark Jefferson: The Anthropography of Some Great Cities, *Bull. Amer. Geogr. Soc.*, Vol. 41, 1909, p. 537-566; reference on p. 555.

Cities and Physiographic Provinces

There is further geographic basis for the classification of these cities in Atlantic Coast, river, lake, and Pacific Coast groups.⁶ The Atlantic cities are on tidal waters within the Coastal Plain Province, Boston being the only complete exception. The largest city of the group, New York, lies in part on the narrow northern extension of this province. The size of the cities becomes smaller as we go southward upon the broader part of the coastal plain. It suffices to name Philadelphia, Baltimore, and Washington. These great cities stand on the inner edge of the coastal plain near the "fall line," where there is a break in transportation. Newark also belongs in this group.

The river cities have the further advantage of belonging to the Mississippi Valley plain. Three of these river cities, St. Louis, Louisville, and Cincinnati, lie on the southern border of the Central Lowland Province. New Orleans stands far south on the Mississippi Alluvial Plain of the larger Coastal Plain Province. Pittsburgh, whose early development was due to its position at the confluence of two rivers, belongs to the Allegheny Plateau section of the Appalachian Plateau Province. Indianapolis and Kansas City (Mo.) have been included in this group, both belonging to the Central Lowland Province. It is apparent that the river group of cities has not as much geographic unity as those of the Atlantic Coast.

The lake group of cities, including Buffalo, Cleveland, Detroit, Chicago, and Milwaukee, falls within the Eastern Lake section of the Central Lowland Province. There is a high degree of geographical unity here. The author has classified Minneapolis as a lake city because it belongs to the Western Lake section and its growth has been to a considerable degree due to its relation to Great Lakes navigation. Pittsburgh has also been classified as a lake city since 1860 because its remarkable growth after this date has been due to the shipment of iron ore on the Great Lakes.

The Pacific Coast cities, San Francisco, Los Angeles, Portland, and Seattle, belong to the Pacific Border Province. Seattle and Portland lie within the Puget Trough section; San Francisco is in the California Trough, while Los Angeles belongs to the Los Angeles Ranges section. All these cities are on navigable waters. Los Angeles, though it is not strictly speaking on the coast, may be classified as a coastal city.

Atlantic Coast Cities

The early centers of population in the colonial period were chiefly commercial ports. Commerce with Europe, especially with the mother country and her other colonies, made possible such northern ports as Boston, Philadelphia, New York, Newport, and Salem. Along this part of the Atlantic

⁶ For this classification the author has used Fenneman's division of the United States into physiographic units; see N. M. Fenneman: *Physiographic Divisions of the United States*, *Annals Assoc. Amer. Geogr.*, Vol. 6, pp. 19-98, Pl. I.

coastal lowlands good harbors abound. From these harbors went such colonial products as fur, fish, wheat, flour, corn, wood, and rum. Rum manufactured in the northern colonies was carried to the coast of Africa and bartered for slaves, who were taken to the West Indies to be exchanged for sugar, molasses, and money. Additional imports through these gateways were cotton and woolen goods and other manufactured articles from Great Britain. In the southern colonies, where the coastal plain was broadest, there were few harbors and fewer ports. Here flourished the plantation aristocracy as contrasted with the commercial aristocracy of the North. The wide plains were favorable to the plantation system. Tobacco, rice, indigo, and a little cotton were their exports, while woolen and cotton goods, household articles, and slaves were the imports. The chief ports of this area were Charleston in South Carolina and Richmond in Virginia.

PHILADELPHIA

In 1790 Philadelphia was first in population rank. It owed this supremacy to its position on the Delaware estuary, in the midst of the best farming lands surrounding any northern city. It was the chief commercial port of the United States as well as the national capital until the year 1800.⁷

NEW YORK

New York in 1790 was second in population.⁸ The situation of New York was not as good as that of Philadelphia because, in the absence of steam navigation and railroads, it had a more restricted hinterland. In 1760 New York was the seventh colony in population, even North Carolina having more people. Manhattan Island was not then considered the most favorable site for a large city; however, as a commercial port, New York was soon to vindicate itself. With its excellent harbor facilities and its easy access to Europe, it soon took first rank in commerce, especially in imports.

The Erie Canal, completed in 1825, was the response to the need of the new settlers of central and western New York who sought a market for their farm products. While it increased the movement of population westward and gave large impetus to New York it by no means made that city the first commercial center of the United States. New York took first rank both in number of people and in the value of its commerce before the Erie Canal was completed. Its superb harbor and an early appreciation of its situation in relation to the western country made New York the chief Atlantic port. The Hudson-Mohawk highway was known as the easiest route through the Appalachian barrier some time before the Erie Canal was completed.

⁷ The seat of the National Government was moved from New York to Philadelphia in 1790.

⁸ "A Century of Population Growth" (U. S. Census Bureau, Washington, D. C., 1909) gives Philadelphia as the first city until 1810. See p. 11.

There were other factors promoting the development of New York up to 1850. The convention of 1822 gave New York state a more democratic government. Suffrage was given to all tax payers, and the city on Manhattan Island became liberal toward merchants. The potato famine in Ireland and economic and political unrest in Germany drove thousands of people to the New World, many of whom settled in New York. Five sixths of those who took up residence in New York City from 1815 to 1865 were Irish or German.⁹ Personalities have often counted for much in the growth of American cities. An illustration is found in Cornelius Vanderbilt, who came to New York in 1829. He commercialized Fulton's invention of the steamboat. Between 1829 and 1848 he owned fifty steamboats which sailed to all parts of the world.

BOSTON AND SALEM

Boston and Salem suffered relative decline after 1790. Salem actually declined as a commercial port while Boston lost its rank to Baltimore. Professor Davis points out that Boston outstripped Salem in great part because it was nearer the interior of Massachusetts, the space being inadequate for the development of both.¹⁰ The Napoleonic wars injured New England shipping. Jefferson's system of embargoes and later the War of 1812 dealt hard blows to her commerce. An expression of this commercial depression is seen in the Hartford Convention of 1814, where New England protested against the carrying on of the war with England.¹¹ When the Napoleonic wars were ended and shipping was made safe, England actively competed with New England ship owners. Many shippers in this period found New York more liberal and emigrated to that port. Manufacturing now took the place of commerce as the dominant occupation of New England, her waterfalls taking precedence of her harbors. This transformation was effected in the period from 1800 to 1850. Many people from the interior of Massachusetts emigrated to the better farmlands of the Genesee country of New York. Boston could not rival New York in this age of internal canal traffic. The Berkshires impeded communication with the western country. Even the railways did not entirely remove the barrier, and Massachusetts declined at the expense of the southwest.¹² The rise of the manufacturing industry and Irish immigration saved Boston as a large center of population.

BALTIMORE

Baltimore, the fifth city in 1790, soon rose to third rank, and became an effective rival of Philadelphia. The situation of Baltimore near the

⁹ Theodore Roosevelt: *New York* (Historic Towns, edit. by Freeman and Hunt), New York, 1891, p. 18.

¹⁰ W. M. Davis: *The United States of America*, in "The International Geography," edit. by H. Mill, London, 1899, p. 722.

¹¹ The report of the convention did not advocate secession, however, as it has often been said. S. E. Morison: *Life and Letters of Harrison Gray Otis*, 2 vols., Boston, 1913; ref. in Vol. 2, pp. 158-159.

¹² Henry Adams: *A History of the United States from 1801 to 1817*, 9 vols., New York, 1889-90; reference in Vol. 9, p. 103.

head of Chesapeake Bay, with the Susquehanna Valley as a contributing region, was most favorable. The farmers of the Great Appalachian Valley in Pennsylvania were, in 1825, indifferent to the proposals of internal communication between Philadelphia and the West.¹³ They had easy transport for their products down the Susquehanna Valley to Baltimore. Its position was also favored by the overland trade from the West. The Cumberland Highway led to the Ohio country by way of Wheeling but did not touch Pittsburgh.

WASHINGTON

It is significant that there is no large commercial city south of Baltimore, in the broader sections of the coastal plain. Washington's growth as a city has been due largely to the location of the seat of the National Government within its borders. As a commercial and industrial city it has never reached the hopes of its founders. "Washington," says Professor Channing, "was undoubtedly influenced in choosing the site for Washington City by the expectation that the new city just below the falls of the Potomac would in no long time rival Philadelphia, New York, and Baltimore as a center of industry and would become the continental mart for ocean-borne commerce—would be, in short, the metropolis of the Western World."¹⁴

CHARLESTON

Charleston, fourth in population in 1790, soon began to lose rank. At first during the period of economic readjustment after the Napoleonic wars, South Carolina was in harmony with the policy of protection of infant industries and a system of internal improvements. When, however, other parts of the country grew at her expense, Calhoun changed his liberal attitude toward protection and internal improvements and declared in the document known as the "South Carolina Exposition" in 1828 that such measures were unconstitutional. South Carolina's clash was with New England, the chief supporter of protection. But was not Charleston's rival New Orleans rather than Boston? In the decade 1810 to 1820 New Orleans moved ahead of Charleston as a center of population and continued to outstrip her in growth until 1840.

River Cities

NEW ORLEANS

The rise of the new West was the most significant fact in the years immediately following the War of 1812.¹⁵ The population was occupying the southwest beyond the Appalachian Mountains. This region triumphed in the election of Andrew Jackson in 1828. The cotton industry expanded

¹³ F. J. Turner: *Rise of the New West, 1819-1829*, New York, 1906, p. 38.

¹⁴ Edward Channing: *History of the United States*, 8 vols., New York, 1905-17; reference in Vol. 4, p. 105.

¹⁵ F. J. Turner, *op. cit.*, p. 67.

from the Atlantic coastal plain and Piedmont region into the Gulf plains. It was this phenomenal extension of cotton culture which determined the history of the Lower South.¹⁶ Soon after 1826 the new Southwest took precedence over the old South Atlantic states in the production of cotton, and New Orleans exported more cotton than Charleston.

It is noteworthy that in the decade 1812 to 1821, before the effective use of steamboats on the western rivers, seven states came into the Union. Six of these are in the West and Southwest. There was much traffic on the central western waters before the steamboat came. Flatboats carried cotton, cattle, corn, wheat, flour, and tobacco to New Orleans. The real effect of the steamboat, made commercially useful by Robert Fulton in 1807, was to push the area of production farther up the Mississippi Valley. This efficiency was in large part due to the new possibility of upstream navigation. This invention, like the Erie Canal, gave strong impetus to a movement of population already begun.

New Orleans had a most favorable situation for this regional development. It naturally became the exporting center for the products of western farmers. A break in transportation, always a strong factor in the development of cities, made necessary a port near the mouth of the Mississippi River. New Orleans never became a large importing city, but in exports it ranked first several times between 1830 and 1840.

CINCINNATI AND LOUISVILLE

Situated in southwestern Ohio, gathering the agricultural products of the rich Miami valley and surrounding region, Cincinnati, called the Queen City, became next to New Orleans the chief city of the West in 1850. It was the center of river shipbuilding, a depot for corn, wheat, and cattle, and a distributing point for corn, woolen goods, and other manufactured articles. Meat packing and the manufacture of flour were its chief industries. As the center of the tobacco trade of Kentucky and as a point of transshipment about the falls of the Ohio, Louisville was in later years sure to become an important center of population.

ST. LOUIS

Still more fortunately located, St. Louis was to be the chief city of this part of the United States and the second city of the great interior plains. Its early rise was related to the exploration and development of the Far West. It became the chief point of departure for explorers and emigrants who followed the western trails. With the rise of river transportation, it was the gathering place for the surrounding farm lands. In the decade 1840 to 1850 the growth of St. Louis was marked by a large influx of

¹⁶ In the then existing ignorance of bacterial life this wide extension of cotton over a geographically suitable region fastened negro slavery on the South. If it had been possible to eliminate the malarial mosquito and the hookworm before Eli Whitney's cotton gin was invented, white and not black labor might have been used in the South (Channing, *op. cit.*, Vol. 4, p. 436).

termans. From 1850 to 1860, when all the other river cities were yielding their rank to the centers of the Great Lakes region, St. Louis was able to hold its position and thereafter began to grow more rapidly. The strongest contributing factors of later years have been the excellent corn and wheat fields as well as the cattle lands about it. It thus developed the manufacture of flour and beer and the meat-packing industry. By virtue of its position it became also one of the terminals in the westward expansion of the railroad. Later, with the rise of manufacturing industries, with abundant raw materials, lead, zinc, glass sands, and iron ore, together with coal from the rich fields of Illinois, the growth of St. Louis was assured.

PITTSBURGH

There was another population center which up to 1860 should be classed as a river city, viz. Pittsburgh, whose favorable situation for western internal commerce during the steamboat period made her a rival of Cincinnati. Manufactured goods came overland from the eastern ports and were sent by boat from Pittsburgh down the Ohio River. While its lot was with the river cities, it rose with them and after 1850 lost rank with them. Pittsburgh was early called a smoky city because of its coal and iron industries, but these were not important until the growth of the Great Lakes region became significant. Then, with the valuable stores of fuel in western Pennsylvania, her position in relation to the iron ore fields of the northern Great Lakes region and the transportation route of the lakes, Pittsburgh was sure to be the site of a large industrial city.

It was not a strange prediction in 1841, in an age of river transportation and internal commerce, that the largest city of the country would by the end of the century be somewhere in the southern part of the interior plains region on a river, either at Cincinnati, Louisville, St. Louis, or Alton.¹⁷ Later, however, in 1843, from the census of 1840 and the fact that the movement of population was toward the lakes rather than the rivers, it was predicted that the chief city at the end of the century would be in the northern half of the central valley somewhere on the Great Lakes.¹⁸ Laumee, now Toledo, by reason of its good harbor, its central position on the lakes, and its connection with the Miami Canal joining Cincinnati and Laumee, it was said, would be this great city. Why did this prophecy fail? Chiefly because it did not forecast the importance of railway transportation.

Lake Cities

An important relationship exists between the physical character of the lake plains and the development of centers of population. This section, with its soils rejuvenated through ice invasion, with easy means of trans-

¹⁷ Charles Cist: Cincinnati in 1841, Cincinnati, 1841; reference in Appendix, p. 283.

¹⁸ *Hunts Merchants' Magazine*, Vol. 9, 1843, pp. 42-46.

portation by water and by land, and with its mineral wealth, especially copper, coal, and salt, and the iron ore of the Superior Upland Province is in natural resources the richest area of the United States. The expansion of the railroad along the lake plains and later across the Great Plains to the Far West, gave a market for these stores of wealth. Within this great agricultural region between the years 1850 and 1900 certain large lake ports developed. They gathered the products of the soil such as corn, wheat, oats, barley, and rye. These were manufactured into flour and beer and later into cereal foods. The cattle lands, together with the salt deposits of Michigan and Illinois, made possible the meat-packing industry. Lumber and building materials were near at hand to facilitate city building. Iron ore and coal were abundant, to make possible the growth of the great iron industries of the lake cities. In these decades thousands of immigrants came from all parts of Europe to help build these cities.

The most significant growth of the lake cities came after 1880. Although its first construction followed 1850, the Sault Ste. Marie Canal became commercially effective after it was enlarged in 1881.¹⁹ The iron ore of the Lake Superior fields was released in larger quantities; there was a marked increase after 1880 in the per capita production of pig iron and coal. The Bessemer steel process gave rise to the great steel industry. In these decades the Great Northern and Northern Pacific Railways were built opening up the wheat fields of the Red River Valley and the Dakotas and extending the cattle lands over the Great Plains. The development of these natural resources increased rapidly after 1880.

CHICAGO

Chicago by virtue of its central position in the heart of this agricultural and industrial region has become the second city of the United States. It is another illustration of the principle that city growth is favored by position far inland on a body of water. Situated where land transportation and water carriage meet, Chicago has an all-water route from the Great Lakes to the St. Lawrence, with easy access to the Lower Mississippi settlements.²⁰ Laid out in 1830 it has become in 88 years the fourth city in the world. Its situation in the prairies of the glacial belt, with coal, iron, copper, lumber, and building materials at hand, and its position in relation to routes of transportation explain this remarkable growth.

CLEVELAND

The growth of Cleveland, the second metropolitan center on the Great Lakes, has been favored by its situation. It was but natural that Cleveland, with its harbor and its location at the mouth of a river, should become the

¹⁹ J. A. Farrlie: The Economic Effects of Ship Canals, *Annals Amer. Acad. of Polit. and Soc. Sci.*, Vol. 1898, pp. 53-78; reference on p. 67.

²⁰ E. A. Riley: The Development of Chicago, Chicago, 1911, p. 33.

northern terminus of the Ohio Canal connecting river and lake waters. The westward migration of New England and New York farmers along the lake plains, later stimulated by the railroads, aided the development of Cleveland. Its commercial and industrial growth have been due to the necessary change between land and water transportation. As it lies on the direct route of iron-ore shipments from the Lake Superior region to the coal fields of Pennsylvania, it is not strange that over half the value of its manufactured products should be in its steel industries.

DETROIT

The swift growth of Detroit in recent times is chiefly due to the manufacture of automobiles and shipbuilding. Detroit was early important in the manufacture of carriages, owing to the supplies of hard wood near at hand. When the horseless carriages came into existence, Detroit began its automobile industry. While the city is favorably situated on the Detroit River, where the traffic of the Upper Lakes passes to the Lower Lakes, it is impossible to explain its growth chiefly on the basis of its geographical position.

BUFFALO

Buffalo owes its early growth to its advantageous position at the edge of the lake plains where Lake Erie discharges into the Niagara River. The Erie Canal connecting the Hudson River with Lake Erie and later the railroad leading from New York to Buffalo greatly favored the growth of the city at this point. Owing to Niagara Falls, Buffalo is situated at a point where traffic by the larger lake steamers ceases and a transfer is necessary from lake to canal boats or from lake steamers to the railroad. Flour shipments to the eastern ports have made Buffalo a center for grain elevators. The iron and steel industries and lumber traffic and more recently the use of electric power generated at Niagara Falls have favored the growth of Buffalo.

MILWAUKEE

Milwaukee has a favorable position for commerce, but it is too near Chicago ever to become one of the largest cities of the United States. Its hinterland is more limited, and it is not on the great east-and-west line of transportation. It owes its growth to the grain trade and to its manufacturing industries.

MINNEAPOLIS AND ST. PAUL

The metropolitan district of Minneapolis and St. Paul has a favorable situation in relation to the wheat fields, is at the head of navigation on the Mississippi River, and has available water power in the Falls of St. Anthony. These conditions have been influential in developing the leading flour mill center of the United States. This district shows how the manu-

facturing industries move westward, following agricultural industry. The westward migration of meat packing from Cincinnati to St. Louis and Chicago and more recently to Omaha, Kansas City, and Lincoln, following the progressive utilization of the cattle lands for farming, also illustrates this principle.

Pacific Coast Cities

Population centers on the Pacific Coast had their beginning after 1850, showed a marked increase after 1880, and experienced their most significant growth after 1900. The transcontinental railways played much the same part in the development of the Far West as did the steamboat in the Mississippi Valley region. It is significant that a second decade in which as many as seven states came into the Union was that between the years 1889 and 1898, when the Dakotas, Washington, Montana, Idaho, Wyoming, and Utah became states. The railroad, following and augmenting the population movement, made possible the marketing of the products of the soil and the minerals of this region. The chief factors resulting in large population centers on the Pacific Coast were the development and marketing of products such as fruits, grains, fish, lumber, and mineral substances. Trade with the Orient and with Alaska has also contributed to this movement of population.

SAN FRANCISCO

The chief city of the Pacific Coast is San Francisco, remarkably situated for commercial purposes on a peninsula at the Golden Gate, the entrance to San Francisco Bay. The wharves are sheltered on the bay side of the peninsula. The city proper, with its surrounding cities, especially Oakland, gives San Francisco seventh rank, next to St. Louis, in 1910, as a metropolitan center. The early growth of San Francisco was due to the discovery of gold in California, to its enviroing fields, and its trade with the eastern United States by way of Cape Horn and with the Orient. The Asiatic trade was an apparent motive for the annexation of California.²¹ By virtue of its position on San Francisco Bay, with room for commercial and city expansion, of its nearness to the natural products of the California Valley, such as fruits, grain, and oil, and of its being already the financial, commercial, and industrial center of the Pacific Coast, San Francisco, it is reasonable to think, will continue to be the metropolis of the Pacific States.

LOS ANGELES

Los Angeles, though larger than San Francisco as a strictly municipal center of population, is by no means as yet a commercial or industrial rival. It labors under the disadvantage of an artificial harbor, built at enormous

²¹ R. G. Cleland: *Asiatic Trade and the American Occupation of the Pacific Coast*, *Ann. Rept. Am. Hist. Assoc. for 1914*, Vol. 1, pp. 283-289; reference on p. 287.

expense, and its hinterland is much more restricted. Its climate and the neighboring fruit regions and oil fields together with its railroad connections explain the wonderful growth of this city of Southern California.

It would be contrary to the earlier tendencies of population movement in the United States for the largest metropolitan center of the Pacific Coast to grow up in Southern California. In the steady westward movement of population centers the northern component has always finally prevailed over the southern. First the Southern colonies were more thickly populated than those of the North. Then after 1820 the Northern States became more populous. The trans-Appalachian movement of population was first toward the southwest after 1810, and not until after 1850 did the old Northwest (Great Lakes region) become more thickly settled. Again, with the further westward movement of people, first the Southwest and then the far Northwest received the greater number of inhabitants.

SEATTLE

There is a rival to the California region on the Pacific Coast. It is found in the Puget Sound trough, with its contributing regions of the Willamette and Puget Sound valleys. Seattle is an important competitor of San Francisco in its foreign commerce, especially in the Oriental trade, since it is nearer to the Orient. It has the further advantage of the Alaskan trade, but this is offset by San Francisco's long-established relations with the eastern United States and with South America. Furthermore Portland is certain to share with Seattle the development of the immediate hinterland. Portland controls the Columbia River fisheries and the products of the Willamette valley. Seattle's large growth has been due to its ocean commerce, its railroad connections, and the development of its back country with its resources of lumber, coal, grains, and fruits. Also it is well situated in Puget Sound for greater commercial expansion, and it will necessarily benefit by the future development of Canada.

SUMMARY

Our cities have grown in a vast country suddenly thrown into the noonday of civilization, a country organized only a little more than one hundred years ago with a free constitution and an invitation to the world to come in. The continent lies open on its Atlantic side, and the tides of population reached the Mississippi River, then passed the continental divide, and moved on to the Pacific Coast. Ample space, fertile soil, and a varied climate offered room and facile adjustment to all. The steamship followed the canoe and the arkboat, and the packhorse and prairie schooner gave way to the iron track and the locomotive. Plentiful crops laid the foundations for population centers, manufactures relieved the New World from undue dependence on the Old, and modern means of transportation made these developments possible and enduring.

Notwithstanding the powerful movement toward the West, the East has not failed to hold its supremacy in numbers. In 1790 all the large cities of the United States were on the Atlantic border. In 1840, counting the ten leading centers, eight were on the Atlantic fringe of the country and two were on the rivers of the interior. In 1900 a review of the first ten cities shows four on the eastern coast, two on the rivers, three on the Great Lakes, and one on the Pacific Coast. Again, in 1917, the Atlantic Coast has four centers, the rivers one, the Great Lakes four, and the Pacific Coast one. The growth of the eastern cities, however, is seen at its true value in the count, not of cities, but of souls. The total population of the four Atlantic cities is somewhat more than 8,000,000. The six centers lying westward show about 5,300,000. If metropolitan districts, notably those of New York and Boston, be added, the disparity is nearly as two to one and goes far to explain the dilatory movement of the center of population which, entering Indiana soon after 1880, has not yet passed its western border.

SOME INFLUENCES OF THE SEA UPON THE INDUSTRIES OF NEW ENGLAND

By MALCOLM KEIR
University of Pennsylvania

Although all the thirteen colonies had access to the sea, in none of them was the influence of tidewater so potent as in the New England settlements. Since the Middle and Southern colonies were better endowed with agricultural wealth than New England, tillage of the soil was their foremost activity. New England alone, poor in farm produce, turned from the stiggardly soil to the generous ocean, where fishing and commerce became the sources of her greatness and gave rise to almost all of her other activities.

SHIPBUILDING AND SUBSIDIARY INDUSTRIES

Within a year of the founding of Boston the first ship, the *Blessing of the Bay*, was upon the stocks, and from that time until the Civil War shipbuilding was one of the most familiar occupations in New England. The white pine that covered the region was especially adapted to sea service because it was buoyant, staunch, and cheap. English oak was heavier, and Baltic fir was more expensive; there was no wood that could compete with New England pine. In 1791 the cheapest construction in France cost \$55 to \$60 a ton, whereas in New England ships could be built for \$33 to \$35 a ton. With the sea at their doors and with fishermen or merchants calling constantly for more craft it is no wonder that shipyards flourished. In 1760 American yards were turning out yearly from three to four hundred commercial boats, and a host of less important ones such as dories, sharpies, and small sail boats. Before the Revolution, out of a total population of approximately 3,000,000 there were no less than 4,000 men engaged in shipbuilding.

The sea not only developed New England commerce and promoted shipbuilding, but in addition it stimulated several subsidiary industries. Among these was the manufacture of rope and cordage. The first ropewalk was set up at Boston in 1641, but soon thereafter every port of any consequence had its own ropemakers. A modern survival of these colonial rope factories may be seen in the great plant at Plymouth, Mass.; this mill within sight of the famous "Landing Rock" is now the greatest works of its kind in the country. Another industry corollary to commerce was food packing. Flour mills, biscuit factories, and salt meat packers were established at the great ports such as Boston, Salem, Providence, New Bedford, New London, and New Haven. The first milk cracker made in America was a product of the Boss Biscuit Company, located almost upon

the docks at New London, Conn. The present-day great pork-packing plants at Somerville, Mass., are descendants of the little establishments that once fitted out deep-sea sailing ships. Along the waterfront of every port, too, there were numerous tailor shops to make the clothing needed by sailors. The ready-made clothing factories of Boston can trace their ancestry to these primitive businesses.

IRON MANUFACTURES

The sea, then, was responsible for New England's prominence in shipbuilding and the allied supply industries, such as ropemaking, food packing, and tailoring. It was the greatest influence as well in promoting the growth of New England iron manufacture because it constituted in its commerce the largest consuming market. We are not accustomed to associate iron manufacture with New England; nevertheless Massachusetts was the leader in iron production from 1650 to 1750. In all the other colonies iron manufacture was a strictly local business using local raw materials and supplying a small local market; but on account of her maritime market New England's iron business was of a more commanding character. The biggest item in iron making was the shaping of nails from bar iron to aid in shipbuilding and the construction of dwellings in the thriving ports. Inasmuch as nails were handmade and the demand was large, it was obligatory for nearly every household to devote its spare time of evenings to hammering out these essential articles. Indeed nails often replaced money in bartering goods at rural stores. It is significant that in 1790 in Massachusetts, where the demand was greatest, the first nail-slitting machine was invented. A survival of the former art is found today at Taunton, Mass., a town now without iron resources, yet the American leader in the manufacture of tacks.

Besides nails there was a large market for iron in Massachusetts for anchors, bells, cannon, and cannon balls—all vital parts of a ship's equipment. The boat's cargo was usually confined in casks or barrels and these were held together by iron hoops; indeed in 1795 one-half the iron output was devoted to the manufacture of hoops. Iron kettles for refining the sugar or molasses brought in by ships, and iron pans for providing the salt that preserved the food for outgoing boats, both created a demand for furnaces and forges. So, all told, the sea provided great inducements for New England iron manufacturers.

WOOD MANUFACTURES

Ocean commerce also gave rise to the cooperage industry. The fish, rum, flour, and other provisions that were carried out of the colonies were packed in casks or barrels; the imports, sugar and molasses, arrived in the same kind of containers, and even staves and barrels themselves became articles of commerce. Cooperage consequently was a promising shore industry created by the deep-sea traffic. New England's resources in wood

gave her such an advantage in barrel-making over European rivals that it was claimed that cheap barrels were as good as an extra 15 per cent profit to American merchants.

In response to the demands for wood along the shore the lumber industry of New England was promoted. At first lumbering was entirely incidental; that is, it was a necessary preliminary to clearing a space for farming. But after shipbuilding commenced, lumbering, although it was largely confined to the winter season, became a regular part of a farmer's activities. The lumber was not only employed for ships and used in constructing the towns that commerce favored, but also was a not unimportant article of commerce, especially with the timber-denuded, plantation-covered West Indies. Where wood as such was not shipped it often passed into commerce in the form of potash, for which there was a constant demand. The burning of wood to potash or pearlash was especially convenient for farmers in new clearings, for the timber that was otherwise a valueless nuisance could be converted without much labor into a revenue producer.

DISTILLING AND THE REFINING OF RAW MATERIALS

Thus the influence of the sea was felt from the iron furnaces and shipyards along the water's edge to the remote inland clearings. Its potency is equally apparent in the industries that sprang into existence upon the ocean's border in order to refine the raw materials brought into New England by returning cargo carriers. Two commodities, sugar and molasses, were the chief return freight from the West Indies. In response to abundant raw materials and a market greater than the production, sugar refining and the distillation of rum from molasses flourished all along the New England shore. Rum at that time was an especially valuable product, in demand by farmers and sailors alike. It was as customary an article of a ship's stores as the sailor's biscuit or salt pork; in outfitting a vessel for a voyage it was usual to allow as much (\$92 to \$275 a trip) for rum as for bread. Inasmuch as the more southern colonies, notably Pennsylvania, turned surplus grain crops into beer and had no raw materials for rum, the distilled spirit was an important article of domestic as well as foreign trade. Massachusetts Bay and Narragansett Bay were famous for their distilleries.

Less repugnant to modern ideals was another distilling industry created by sea trade; namely, the manufacture of fish oil, whose principal source of material was the whale fisheries. Since New Bedford, New London, and Stonington were the chief home ports for the whaling fleets these towns became the leading whale-oil centers. The fishing and commercial ships required large amounts of salt for packing the catch or preserving provisions. This salt was refined from sea water, and the process was a well-known occupation from Long Island to Marblehead. Another item often listed in the cargo of home-coming boats was the cacao bean, the raw

material for the refining of chocolate and its by-product cocoa. The first chocolate factory was erected near Boston, and it is interesting to note that a chocolate plant still operates upon the same site.

Among other imports, New England received considerable gold and silver in payment for fish, rum, and lumber. The precious metal carried into Providence, R. I., gave birth to the jewelry industry in that place; and later, when an ingenious Yankee there made use of the art of plating, the foundation was laid for the fame of Providence in the jewelry industry. Today the nation's greatest center for the manufacture of cheap jewelry is the town of Attleboro, Mass., just beyond the boundaries of Providence, and the latter city is still the principal selling agent for plated metal ware.

Rubber manufacture is likewise largely confined to New England because her ships brought crude rubber to her shores along with other curious products from out-of-the-way places. Boston, Providence, and New Haven each received goodly shipments of raw rubber. Very little use was made of it, however, until Goodyear and Hayward discovered that an admixture with sulphur prevented rubber from softening under heat and becoming sticky. Sulphur also gave rubber new properties and greatly extended its application to industry. The new plants for the manufacture of overshoes, fountain-pen barrels, hose, gloves, webbing, and dozens of other rubber products rose near Boston, Providence, and New Haven and may be most often seen in those districts even at the present day.

COTTON MANUFACTURE

These industries—rubber, jewelry, chocolate, and refining—however, have never been New England's greatest manufacturing assets. Since 1800 first place must be given to textiles and shoe manufacture. Here, too, the sea with its traffic has had an important bearing upon New England's success in these branches of manufacturing.

As everyone knows, the inventions that placed textile making upon a machine factory basis were made in England and not in the United States. Although we had made crude attempts to spin yarn by machines at Beverly and Bridgewater, Mass., and at Providence, R. I., and some attempts also at Philadelphia and at Stateburg, S. C., none were successful until the arrival of Samuel Slater, an English immigrant, especially trained in the art of machine spinning. Slater first went to Philadelphia, but, receiving no encouragement there, he tried employment in New York. In that city a captain of a Providence sailing packet told him that Brown and Almy, merchants of Providence, were experimenting with cotton manufacture and wanted a man who understood machine spinning. From this chance Slater went to Providence and under Brown and Almy set up in 1790 the first successful cotton-spinning factory in America. Within twelve years men trained in this mill established twenty-nine other cotton factories in

nearby Connecticut and Massachusetts, thus making Providence the chief seat of cotton manufacture in America. The raw materials for these early mills were ocean-borne. The cotton did not come from our own Southern colonies, for England bought our entire crop; but our early New England mills were exclusively sustained by the commerce carriers plying between New England ports and Dutch Guiana and Santo Domingo.

Beginning in 1814, when power weaving was first applied in a complete factory at Waltham, Mass., the cotton industry passed into a second phase in which it retreated inland from the port towns to water-power sites. The principal influence of the sea in this era was the supplying of capital. Merchants engaged in commerce were the only persons in America who had free capital to experiment in the new manufacturing ventures. The most famous cotton mills, such as those of Lowell and Lawrence in Massachusetts, and Biddeford, Lewiston, and Saco in Maine, were all established by merchants whose fortunes had been derived from overseas trade.

About 1840 cotton manufacture entered a third phase, wherein the sea again became more dominant. At this time steam-driven mills began to appear, first at Newburyport, Mass., and then at Salem. Coastal mills using steam engines had an advantage over inland factories because coal could be brought to their doors cheaply by water. As steam engines were improved the steam-driven mills steadily encroached upon the business of the inland water-power factories, and after the Civil War the coastal mills wrested the crown of supremacy from the Merrimac Valley. Lowell, long champion, had to bow before Fall River, the new leader. New Bedford, neighbor to Fall River, has now outstripped her in quantity production, just as she has long claimed the primacy in quality. Cheap transportation of fuel has been of great advantage to these tidewater mills. They also benefit by cheap carriage of raw cotton; for, although the material now seldom arrives by water, potential competition of the sea keeps down railroad rates. Furthermore, the maritime climate benefits the coastal mills. Since the rubbing that cotton gets in manufacturing creates frictional electricity, the yarn twists and snarls in dry air, but a moist atmosphere helps to disseminate the current; hence a high humidity is favorable to cotton manufacture. The coastal mills gain this humidity at all times by their proximity to the sea, and the frequency of fogs adds to the benefits of the location. Humidity is even more necessary to American mills than English because our machinery is belt-driven, whereas the English is geared. As everyone who has been in an American factory knows, moving belts create a large amount of electricity.

Our cotton industry, then, was sent to New England by a sea captain, its mills were first supplied by New England's regular commercial carriers, its later mills were equipped by commercial capital, its modern plants are advantageously situated in respect to fuel and raw materials, and, finally, the coastal factories benefit by a maritime climate.

SHOE MANUFACTURE

Not only the cotton industry, but the shoe industry as well, has been able to attain first place in New England because the sea was close at hand. Although shoemaking was a local industry in all the American colonies, it attained distinction in Massachusetts. Everywhere else the village cobblers were hampered by a lack of raw material and confined to a local market by the difficulties of transportation. Only at Lynn, Mass., were these obstacles removed. Lynn lay between Salem and Boston, two of the principal colonial ports. The boats that carried fish and other products away from these harbors brought back cargoes of hides collected from scores of places touched on the voyages. Some vessels made special trips to the west coast of South America and California with the sole purpose of gathering hides for the New England tanneries. Lynn as a result never suffered from a scarcity of raw materials. Likewise the coastal trading boats putting out from New England carried shoes to the other Atlantic colonies and states. Shoes made from California hides often took a second voyage around South America to be sold to the Mexicans of Santa Barbara, California. Lynn took precedence of all other Massachusetts coastal towns in shoemaking because by accident the subdivision of labor in shoe manufacture was first applied there. This device enabled most of the sewing upon shoes to be passed out to women in their homes. The women most eager to secure extra income were those in sailors' families, because the breadwinners were often away for months or years upon extended voyages. Lynn owed its shoe industry to the ocean transport of raw materials or completed shoes, and to the labor force built indirectly by overseas commerce.

Thus from New England's earliest industries, fishing, commerce, and shipbuilding, down to the present leadership in cotton and shoe manufacture, the sea has been a potent influence. Several of the minor manufactures, such as rubber products, jewelry, or refining, originated in New England because the ocean enabled the raw materials to be collected at a favorable situation.

THE "OLD-FASHIONED" WINTER OF 1917-18¹

By CHARLES F. BROOKS

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In the United States east of the Rockies the past winter was remarkably cold. Some of the details can be explained, even though the reason for the occurrence can only be surmised. The early appearance of freezing temperatures in the Mississippi Valley heralded a type of weather which, with cold waves of increasing severity, overspread the United States east of the Rockies and then held the country in its icy grip for two months. Finally, a sudden warm spell saved from catastrophe the almost despairing cities of the East. In the autumn, corn was caught unripe; winter wheat did not make proper growth; cotton picking was interrupted early; truck crops and fruit were damaged. In the winter, the already over-burdened railroads were blocked by snow, or their locomotives were barely able to keep up steam in the below-zero gales; while rivers and harbors were locked with ice of unprecedented thickness. Even Nantucket was tied to the mainland by a 15-mile ice bridge. Many industries, without their normal income of supplies and outgo of finished products, were forced into partial shut-downs or complete suspensions of work. People suffered from the severe cold, the lack of fuel threatening serious consequences with each renewed snowstorm or cold wave. Moreover, other parts of the world were also experiencing record-breaking droughts, floods, storms, cold, or heat. What was the cause? Variations in solar energy received by the earth must have been basically responsible. The effects of a more energetic atmospheric circulation are manifested differently in different parts of the earth, especially since snow-covered lands and unusual ocean temperatures are frequently involved in the final results. While the present degree of solar activity lasts, further extremes of weather are not unlikely. But these cannot yet be forecast.

A survey of the winter just passed, however, does bring out some immediate connections of the weather with local water temperatures and snow cover, as well as the general tendency to extremes in terrestrial weather. Before taking up the phenomena of the past winter, let us take a general

¹ General references:

U. S. Weather Bureau Publications:

Daily weather maps of the United States, published at Washington.

Snow and Ice Bulletin, published weekly, December to March.

National Weather and Crop Bulletin, published weekly, April to September, and monthly, October to March.

Climatological Data for the United States by Sections, monthly.

Monthly Weather Review.

Reports of the Associated Press, and special reports in the *New York Evening Post*.

Symons's Meteorol. Mag., London, containing a summary of British weather each month.

view of the following points: (1) how the 11-year sunspot cycle is connected with the earth's weather; (2) how changes in the intensity and position of the "grand centers of action" of the atmosphere produce great regional abnormalities in temperature and rainfall; and (3) how local temperatures where water or snow prevails affect the weather.

THE 11-YEAR SUNSPOT CYCLE

The 11-year sunspot cycle is a cycle in solar activity, during which the sun radiates the most heat when spots are most numerous.² For some reasons, however, the earth in general is colder than when the sun radiates less. At any rate, as we should expect, the atmospheric circulation is most energetic when the sun is sending the most energy. Changes in the strength of the atmospheric circulation necessarily go hand in hand with changes in the steepness of the barometric gradients. In other words, the great high pressure areas are higher than usual and the low-pressure areas lower than usual in times like the present, when the sun is hotter than usual.³

CHANGES IN THE "GRAND CENTERS OF ACTION" OF THE ATMOSPHERE

Now, let us consider the second point: How do changes in the intensity and position of the "grand centers of action" of the atmosphere produce great regional abnormalities in temperature and rainfall? In consequence of the general circulation of the earth's atmosphere there tend to be belts of high pressure at the horse latitudes—about 30° N. and S.—and troughs of low pressure in subpolar latitudes. The contrasts between the temperatures of the continents and oceans, however, produce the well-known tendency to continental high pressures in winter and low pressures in summer while there is the reverse tendency over the oceans. In the northern hemisphere winter, therefore, we have such subpermanent centers as the Icelandic and Aleutian "lows" and the North American, Eurasian, Hawaiian, and Azores "highs." These highs control the directions and strengths of the general winds, and in this way they control the weather characters of the different regions. With normal positions and strengths there occurs the normal weather in the different regions, anomalous though this weather may be when compared with the means for the latitude. What temperature departures will be produced by an intensification of these centers of action? The places already too warm for the latitude will become warmer and those too cold will become colder: for instance, western North America should become warmer and eastern North America colder than usual. Rainfall differences will be intensified in much the same way: interior regions usually dry may become very dry with the higher pressure while peripheral regions usually wet may become extremely wet with the stronger cyclonic activity. Increased circulation had general results of

² C. G. Abbot: *The Sun and the Weather*, *Scientific Monthly*, Vol. 5, 1917, pp. 400-410.

³ H. Arctowski: *Variations in the Distribution of Atmospheric Pressure in North America*, *Bull. Am. Geogr. Soc.*, Vol. 42, 1910, pp. 270-282.

this sort in North America during the past winter. But with shifts in the positions of the centers of action, wind directions are changed, and with winds from unusual directions the character of the weather will tend to depart from the normal, in general corresponding to the difference between the usual weather brought by the new wind and that by the normal wind. An apparent westward shift of the Eurasian high this winter gave to Europe a continental climate in many respects like that of the interior of North America.

CONTROL OF THE WEATHER BY SURFACE TEMPERATURES

At all times, the diverse temperatures of water, land, and snow surfaces control weather details, which, when long continued, become large features. These surfaces affect not only the temperatures and moisture content of the winds, but also control the paths and strengths of cyclones and anticyclones. Water surfaces, whenever warm relative to the surrounding temperatures, always become centers of cyclonic activity and, therefore, are stormy. Snow surfaces and water surfaces, when relatively cool become, on the other hand, areas of quiet coldness.⁴ Applying such tendencies to the past winter in the United States the weather facts fall naturally into place. On account of the high specific heat and mobility of water, air temperatures in autumn over water tend to remain higher than those over land. When the land is cold, as it was this winter, the contrast may become so strong that unusual storminess results on the border between the cold land and the relatively warm water. The potential energy of the water vapor helps to increase the storm energy over what the mere temperature contrast might produce. The limited maximum temperature of a snow surface, its reflecting qualities, and its very low conductivity favor the excessive cooling of the air. The snow-cover, when once established, will tend to maintain itself in a number of ways. (1) Under these conditions melting and evaporation are slow processes. (2) The prevailing coldness of the air favors the occurrence of snow rather than rain with passing storms. (3) The cold air is dense, and, therefore, favors high pressure, which in turn will aid in the formation of storms on the edge of the snow cover, where a temperature contrast is likely also.

Here is our background for the extraordinary weather of the past winter: (1) a hot sun, therefore a general tendency to strong continental winter anticyclones and ocean cyclones, with corresponding storminess and coolness; (2) for North America a strong winter anticyclone favoring coldness in the east and warmth in the west; (3) where there are strong temperature contrasts, particularly great storminess, but where the contrasts are small, relatively quiet weather.

⁴ See, for instance, H. J. Cox: Influence of the Great Lakes upon Movement of High and Low Pressure Areas, *Proc. 2nd Pan-American Sci. Congr., Washington, Dec. 27, 1915-Jan. 8, 1916*, Section II, Vol. 2, pp. 432-59, Washington, D. C., 1917.

AN UNUSUAL AUTUMN IN THE UNITED STATES

The advance guard of our cold winter appeared on August 8 when a strong winter type of anticyclone, or "high," entered the United States from the Canadian Northwest. Freezing temperatures occurred on the morning of August 9 over a considerable area in the northern Great Plains. Similar dry and clear and, therefore, cold high-pressure areas entered on August 27, September 8, and September 22. The first produced the first killing frosts in most of North Dakota, northern Minnesota, and Wisconsin; the second cold period, September 9 to 14, brought killing frosts east of the Mississippi and north of the 40th parallel. A procession of three more "highs" from the Canadian Northwest entering the United States on October 4, 7, and 11 so reinforced one another that freezing temperatures were flung southward into Texas, southern Mississippi, and eastern North Carolina—far beyond the regions where killing frosts had previously been reported so early in the autumn. The sequel was a snowstorm in the southern part of the Great Lakes region. A similar group entering the country October 18, 20, and 22 pushed the frost line to the Gulf coast and into Florida. There was another Great Lakes snowstorm, with light snowfall south into half of Tennessee. The climax of the wintry autumn came from October 28 to 31, when a tremendous cold wave with unheard-of October temperatures swept out of the northern Rockies and across the plains south to Mexico and east to the Gulf and Middle Atlantic coasts. The temperature at Denver fell to -2° F. and that at Pueblo, Colorado, to -4° F. Again, a Great Lakes snowstorm occurred. The continual cloudiness and unusual storminess, particularly during the last ten days of October in the northeastern quarter of the country, were reflections perhaps of the temperature contrast between the warm lakes and the prevailing cold weather about them. From the Missouri and Mississippi Rivers eastward this October was the coldest on record in most states and the wettest in many. The snowfall was extraordinary for October. Many stations in West Virginia had 15 inches, and central Wisconsin received $17\frac{1}{2}$ inches during the month. More than two feet of snow fell at the higher stations in the Black Hills.

EXTREMES OF WEATHER IN OTHER REGIONS

Unusual weather was not confined to the eastern United States nor to this continent. Over a large part of the United States west of the Rockies October was rainless or almost so and considerably above normal in temperature. Many places had the highest October temperatures on record, e. g. San Francisco, 96° F., Needles, Cal., 112° F. A flood in China in late September and early October is said to have been without parallel in destructiveness of life and property. A typhoon, particularly destructive in Tokyo, reported October 1, seems to have formed at the same time as a similar storm which visited the southeastern United States two days earlier.

In Natal, on October 27-28, four months of abnormal rainfall culminated in a storm yielding more than eight inches in 24 hours and producing disastrous floods. The weather of the British Isles was not unlike that of the northeastern United States: "low mean temperature, and a general excess of rainfall with frequent and unseasonable snowstorms in northern districts."⁵

NOVEMBER WEATHER

The first twenty days of November in the northeastern quarter of the United States stood in marked contrast to the closing decade of October. November was generally quiet and dry throughout the country. Over the northern Great Plains, the warmest November on record was sandwiched in between the coldest known October weather and an extraordinarily cold December. In much of this region November was actually warmer than October, locally in North Dakota the mean for November being more than 4° F. higher than that for October. Whereas at Sheridan, Wyo., a temperature of -12° F. had been recorded in October, the lowest in November was +18°. Farmers were able to resume plowing and, near the Rocky Mountain front, to continue with few interruptions till Christmas. The weather of the British Isles also was mild, the temperature being only very slightly lower than that of October. The south was extremely dry, but the west of Ireland and northwestern Scotland were exceedingly wet. The eastern third of the United States remained below normal in temperature during November, as for many previous months. In the last of November killing frosts occurred generally on the Gulf coast and into central Florida, and in the eastern Great Lakes region a heavy snowstorm was followed by record low temperatures for November, reaching -16° F. at Moira, N. Y.

DECEMBER WEATHER

December continued the weather type of October. A trial cold wave entered the United States from the Canadian Northwest on December 3, and on December 7 a more substantial one entered the northern Great Plains just as a strong cyclone was beginning to operate over the southern Great Plains. Considerable snow fell over the Plains south to Oklahoma and central Arkansas. Then, as the storm advanced eastward and gathered energy from the moisture of the Atlantic and the Great Lakes, the snowfall became heavier over the Ohio Valley, where on a strip less than 50 miles wide one to three feet of snow fell; and in the lee of Lake Ontario parts of western New York were buried under two feet of snow.⁶ This snow cover with later additions helped to maintain the below-zero weather in the Middle West until December 17. The lowest temperatures in this cold spell, except west of Lake Michigan, occurred in the immediate

⁵ Symons's *Meteorol. Mag.*, Vol. 52, 1917, p. 119.

⁶ See the maps of daily snowfall in the cyclone of February 20-23, 1912, which took about the same route, *Monthly Weather Rev.*, Vol. 42, 1914, pp. 325-330.

vicinity of the Ohio River on December 9, 10, and 11, before the deep snow had increased in conductivity by becoming packed. The extremes were -25° F. in western Tennessee, -20° in western Kentucky, -30° in southern Indiana, and -31° in southern Ohio. In western Tennessee the four stations with minima of -20° or lower were in a narrow belt immediately southeast of the heaviest snow belt but still within the region with six inches or more of snow on the ground. Cairo, near the windward edge of the snowy belt, had a minimum of -7° ; while Nashville, with but three inches of snow and lying a short distance southeast of the cold strip reported zero as the lowest.

NEW LOW RECORDS OF TEMPERATURE

Owing to a thaw in the Middle West from December 18 to 24, as some of the northern cyclones were able to cross to the Great Lakes and eastward, the snow line temporarily receded to the Great Lakes region and the Appalachians, only to return as on December 27 the greatest anticyclone of the winter began slowly to settle over the country. In the Yukon probably a new minimum temperature for the North American continent (-86° F.) was reported at the mouth of the Pelly River. In the Appalachian and Atlantic coast region, where the snow still remained on the ground, this cold wave established new low December records for most states, and at many stations (New York City and Boston among them) the weather was the coldest ever recorded since 1870 at least. Except for Kentucky and Maryland the following minima established new state records for December, during the past twenty-five to thirty years at least: West Virginia, -37° ; Maryland and Tennessee, -32° ; New Jersey, -29° ; Virginia, -27° ; North Carolina and Kentucky, -21° ; South Carolina, -6° ; Michigan, -38° ; South Dakota, -45° ; Iowa, -40° ; and in New England a range from -45° in Maine to -16° in Rhode Island.

The month as a whole was either the coldest or the warmest December on record in about two-thirds of the United States. The New Jersey section summary considers that it will "serve to refresh the memory of the 'oldest inhabitant' regarding an 'old-fashioned winter.'" In Ohio, a 60-year record fails to show a colder December. The "ice conditions on the Ohio River at Cairo exceeded in severity anything in the memory of the oldest inhabitant" (Illinois section summary). In marked contrast, a part of the United States west of a line fifty to two hundred miles east of the Rocky Mountain front was warm. In southern Idaho the mean for the month was locally 12° above normal: it was so warm that winter grain, alfalfa, clover, and grasses made considerable growth. And yet only three hundred to four hundred miles to the northeast Havre, Montana, was 13° below normal. The immediate cause of this sharp contrast was the prevalence of southwest winds across the mountains and of northeast winds on the Plains. For most states December was a dry month, for some the

driest December on record. From Texas to Nevada and California practically no rain or snow fell. In Texas, it was the driest of sixteen consecutive dry months. On the other hand, western Washington, western Oregon, northern Idaho, and northwestern Montana were extremely wet. One station in Washington, Cedar Lake, reported 46.80 inches of rain during the month.

JANUARY WEATHER

Like December, January was cold and snowy but dry in the central and eastern United States. The presence of the extensive and deep snow cover seems to have been primarily responsible for this cold weather, in spite of subnormal pressures throughout the eastern half of the country. In fact, there seems to be little occasion to consider the weather of this month as being under any control beyond the immediate effects of the land, snow, and water temperatures and moisture supply. As in the region east of the Mississippi in December, the greatest departures of January temperature from the normal occurred in those areas with the greatest depth of snow on the ground, if the upper Great Lakes region and the northern Appalachians, which are normally snow-covered, are left out of consideration. As expected, a series of intense cyclones which followed in a general way the southern edge of the snow-covered area produced snowstorm after snowstorm for some distance southwest and south of the Great Lakes and on the Middle Atlantic Coast. Many cyclones entered the warm, moist Great Lakes region and produced almost daily snows on the lake shores. In the Middle West the blizzard of January 12 will long be memorable as "that old Saturday" for its southwest gale with driving snow at -20° F. On the main line of the Illinois Central Railroad in central Illinois, it was reported that there was no traffic to or from Chicago for forty-eight hours. In the south, snow fell into the Gulf of Mexico (the snow at New Orleans being the first in thirteen years), and in Texas south almost to Brownsville. The very intense cyclone responsible crossed the central United States along the southern edge of the snow cover and then moved northward to the favorable temperature and moisture environment of the Great Lakes. The cold air was supplied by an intense anticyclone in Alberta on January 10. The heaviest snowfall during the month occurred near the southern end of Lake Michigan, notably at Milwaukee and Chicago, where the falls of 2.6 and 42.5 inches respectively exceeded the record for any month and the normal amount for a whole winter. There was no rain at Chicago during the month. This heavy snow on the southwest border of Lake Michigan was brought principally by cyclones passing on the south. It was snowier here than elsewhere south of the Great Lakes because the northeast snow-bearing winds had over Lake Michigan the greatest unobstructed sweep over a water surface. Topographic influences and more intense cyclonic activity produced another belt of extraordinary snowfall,

locally four feet, on the Ozark Plateau and over the Ohio River. The Middle Atlantic coast continued snowy because of the numerous cyclones passing over or up the coast, between the Gulf Stream and the cold, snow-covered land. With so much snow on the ground it is not surprising that in the Ohio Valley and eastward the temperature rarely rose above freezing and occasionally fell below zero. Extremely cold weather prevailed in New England through the month. The average temperature for the section, 13.2° , was the lowest for any month since 1888 at least. "In a record extending back to 1836, at Amherst, Mass., the average temperature of the present month was lower than that of any month heretofore. The greater portion of the precipitation was snow, which, in the interior of the northern portion of the section, accumulated to between three and five feet in depth."⁷ Much snow, cold, relative dryness: these are interrelated elements. The Ohio section report states: "It is safe to say it (January) satisfied to the last degree the longings of the most fastidious for an 'old-fashioned winter.'"

FEBRUARY COLD WAVE

A final severe cold wave which occurred early in February in the northeastern United States was the coldest of the winter at many places. Even at Provincetown and Nantucket the temperatures fell to -6° F. The ice in Long Island Sound was said to have been the heaviest in more than fifty years. It was reported that for the first time known the main channel used by Boston to New York ships between Nantucket and Cape Cod was closed by a solid bridge of ice. Some tugs were icebound for twenty days.

THE WINTER IN EUROPE AND ELSEWHERE

European weather was not unlike that experienced in the eastern United States. The British Isles in December had low mean temperatures and deficient rainfall. London had the coldest December since 1890. The winter weather continued with severity till the middle of January, after which the weather was remarkably mild. The cyclone which brought the first general snowstorm in the United States, December 7-10, seems to be the same which with a northwest gale, snow, and extreme cold unroofed houses in Queenstown on December 15 and then tied up the traffic in and about Paris on December 16. On January 2, a Paris report mentioned another heavy fall in central and eastern France which snowbound the region, St. Etienne having three feet. The temperature at Lyons was at zero (F.)—an almost unheard-of cold for that region. Paris was experiencing less snowy and somewhat milder weather. A January 10 report from Stockholm told of unprecedented temperatures in northern Sweden, a minimum of -70.6° F. occurring at Asele. Early in February Madrid reported one of the most severe winters in years, following an autumn with

⁷ New England section of the "Climatological Data," January, 1918.

no rain. "The snowfall in Asturias has blocked up the Puerto Pajarez, and the trains remain for days in the snow-drifts, unable to proceed." In Madrid the government departments had no coal, Seville had no gas, Valeneia no wood. From the southern hemisphere came the reports that late in January and again early in March tropical cyclones produced great damage in Queensland. In the middle of February, Natal and Johannesburg were again flooded by rains, which at some places amounted to nine inches or more in twenty-four hours.

With similar cold weather in North America and in Europe, it seems reasonable to point to a world-wide connection—one possibly controlled by unusual conditions on the sun. Proof must await the reduction of the solar radiation values for this period. The weather proved characteristic of a winter period under the influence of an active sun.

SUDDEN WARMTH IN THE EAST

In the eastern United States, the weather moderated immediately after the early February cold wave. The temperature at Cleveland, for instance, rose from -12° to $+40^{\circ}$ F. in twenty-four hours. From February 6 to 14, the temperature in the middle Mississippi Valley and the middle of the northern Plains averaged 15° to 20° above normal. The snow cover disappeared with almost unbelievable rapidity north nearly to the Great Lakes and along the Atlantic coast to New England. Although there were other cold waves, this general moderation of the weather marked the end of the extraordinarily cold and snowy winter which had dominated the central and eastern United States since early December. If it had not been for the snow cover, it seems as if the change would have occurred ten days earlier, when the first "lows" began to cross the northern United States first to the Great Lakes and then to the Atlantic. Earlier in the month three such storms had gone to pieces over the northern Plains and re-formed in the warmer South.

SUDDEN CHANGE ON THE PACIFIC COAST

There was a change in the weather type on the southern Pacific coast at the same time with that in the eastern United States. During the fall and winter, Utah, Arizona, Nevada, California, and some of the surrounding regions were experiencing an almost unbroken drought and unusually warm weather. A severe shortage of water for irrigation was threatened, for there was scarcely any snow on the mountains. For instance, the snow on the ground at Summit, Cal., at the end of January was but two inches as compared with the usual six feet at this time of year. But at the same time that the heat was turned on with such unexpected suddenness in the East, the water was turned on in the Southwest. Central California's first heavy rainstorm of the winter came from February 4 to 6, and heavy rains commenced in southern California on February 17. Until these heavy

rains occurred, San Francisco had had less than 20 per cent of the normal winter rainfall and Los Angeles less than 10 per cent. All talk of a water shortage was silenced by a heavy fall of snow on the Sierras, which at Summit amounted to about ten feet for the month. Aside from any direct solar effects the relations of water to air temperatures here may have been sufficient to change the weather type. For a few months the winds on the Washington and Oregon coast had been rather strong from the southwest, especially in December. If these winds extended farther south offshore it seems reasonable that the warm water driven north should after a time have favored cyclonic action, especially since the lands had cooled to temperatures probably below those of the water.

Another aspect of water temperatures is manifest in the spring following such a severe winter. For example, in the northeastern United States the heavy snow on the ground in the northern highlands and the coldness of the Great Lakes and of the coastal waters north of Hatteras continued to favor dry weather even into April. Similar conditions have been observed in the Baltic region after a cold winter.⁸ Does this explain the dry spring weather of the western battle front this year?

SUMMARY

Such were the characteristics of our remarkable winter. The causal sequence of events seems to have been as follows: In the first cycle: great continental anticyclone—clear, dry air—strong radiation—cold—snow with the next passing cyclone. The second cycle is more complicated and longer: another anticyclone—intense cooling of the snow surface and overlying air—extreme cold—dense lower air—maintenance or increase of high pressure—marked temperature contrast between snow cover and the bare land or open water—strong cyclonic action with more snow near the border of the snow cover. And then another intense anticyclone begins a third cycle like the second. Finally, long-continued southerly winds eliminate most of the snow cover, and then the warmth of the early spring sun shining through the dry air prevents the recurrence of another winter cycle. The anticyclones thus initiate a long train of weather reactions. Was each of these anticyclones produced by a sharp increase in the solar energy received by the earth? A periodic recurrence noticeable in the highest pressures observed in the region embraced by the United States weather map is suggestive of such a connection.⁹ The past “old-fashioned” winter, then, may have been caused by a sun hotter than usual which brought on self-perpetuating cold waves and droughts.

⁸ H. H. Hildebrandsson: Quelques recherches sur les centres d'action de l'atmosphère, *Kungl. Svenska Vetenskapsakad. Handl.*, Vol. 51, 1914, No. 8.

⁹ H. H. Clayton: Effect of Short-Period Variation of Solar Radiation on the Earth's Atmosphere *Smithsonian Misc. Colls.*, Vol. 68, No. 3, May, 1917, p. 18 (reviewed in *Geogr. Rev.*, Vol. 5, 1918, p. 244).

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Presentation of the Cullum Geographical Medal to Professor Frederick H. Newell; Meetings of April. At a monthly meeting of the Society on April 23, at the Engineering Societies' Building, 29 West Thirty-ninth Street, Professor Frederick H. Newell of the University of Illinois, the former Chief Engineer, later Director, and now Consulting Engineer of the U. S. Reclamation Service, was presented with the Cullum Geographical Medal.

President Greenough presided. After he had submitted the names, approved by the Council, of 151 candidates for Fellowship, all of whom were confirmed as Fellows of the Society, the award took place. In presenting the medal President Greenough spoke as follows:

"The practice of introducing water to fertilize the land is as old as history, but its adaptation to existing conditions illustrates the complexities of modern life. In this country it has involved not merely the use of the ordinary flow of our streams but the impounding of their flood waters in vast reservoirs and the diversion at times of their entire currents, together with complicated collateral issues. It is clear that operations of such magnitude and character could only be conducted by Government agency, and accordingly, in 1902, Congress created the Reclamation Service, working in conjunction with the Hydrographic Branch of the U. S. Geological Survey to carry out the national policy for irrigation of the public lands.

"Our guest of the evening was made Chief Engineer and later Director of the Reclamation Service, and chiefly to his labors during the past fifteen years is due the successful prosecution of a vast system of public works unsurpassed in their design and influence.

"In President Roosevelt's annual message in 1901 he asserts that 'the forest and water problems are perhaps the most vital internal questions of the United States.' And his Secretary of the Interior sets forth 'the importance of providing through wise administration for the creation of homes for millions of people upon the arid but fertile public lands.' These quotations outlined the responsibilities with which the Reclamation Service was intrusted and which it has continuously exercised. Their execution comprised not only the building of great engineering structures but also the determination of even more difficult questions of soil, location, and settlement, together with considerations of an economic, legal, and social nature, often most intricate and delicate. Suffice it to say that all difficulties have been triumphantly surmounted, and the Nation is justly proud of the achievements of a Service which has transformed a wilderness into a garden, with provision for its distribution in suitable holdings amongst permanent settlers. With every one of its accomplishments the name of Frederick Haynes Newell is linked as the principal agent, and it is our privilege tonight to pay tribute to his career of devoted and successful labor in behalf of his country.

"And now, Sir, as President of the American Geographical Society, I ask your acceptance of the Cullum Geographical Medal. The inscription on it attempts to epitomize your work and its beneficent results. It reads:

FREDERICK HAYNES NEWELL
ORGANIZER AND DIRECTOR OF THE
UNITED STATES RECLAMATION SERVICE
1907-1914

HE CARRIED WATER FROM A MOUNTAIN WILDERNESS
TO TURN THE WASTE PLACES OF THE DESERT
INTO HOMES FOR FREEMEN

"We trust that this memorial will not be unwelcome, representing, as it does, the appreciation, by our thirty-eight hundred Fellows, alike of your conspicuous creations and of their humanitarian accompaniment."

In accepting the medal Professor Newell said:

"The receipt of this medal gives keen pleasure not merely as a recognition of individual effort, but far more than this as a visible evidence of public appreciation of the notable efficiency of a group of men and women—public servants—united in putting into material form an ideal to which all have been devoted. This ideal, founded on geo-

graphical studies, has been that of creating homes for landless citizens, not by depriving others of their portion, but by utilizing the waste places and the otherwise lost or even destructive forces of nature.

"This ideal, furthermore, has been embodied in an organization—the Reclamation Service—founded in the determination to demonstrate that every one of its employees, whether engineer or clerk, could and would consecrate his life to the highest good of the public. As a result there have been few organizations comparable with this service in mutual respect and unity of action combined with sound business methods. This has been displayed in investing a hundred million dollars of the national wealth in such way that the annual returns measured in dollars are nearly 100 per cent, but where the less tangible but more important profits in better citizenship are immeasurably greater. Bound together by strong ties of true missionary spirit, this Service has persisted in its loyalty to the high ideals and to the men who have aided in making these real.

"On this occasion especial mention should be made of the lifelong devotion to this cause of the late Senator Francis G. Newlands, whose name is inseparably linked with the original law, and of the untiring activity of George H. Maxwell, who sacrificed the best part of his life to make plain to the people the objects and benefits of the Newlands bill: nor could anything have been accomplished had not President Roosevelt thrown his strength into the passage of the measure and toward the initiation of the works which were thus made possible and in whose successful planning and execution scores of devoted public servants, each notable in his or her devotion, have taken part."

After the presentation, Professor Newell addressed the Society on "Home Making in the Arid West." In the course of his illustrated lecture Professor Newell pointed out that over a hundred million dollars has been invested by the Government under the terms of the Newlands bill; already food products to that value are coming back annually, and opportunities made for thousands of homes. The important point is that experience has been had and a demonstration made as to the practicability of operations on a still larger scale to provide more homes and more farms for our population and for the other thousands of men and women who must look for new occupations. Moreover, as shown by this experience, it is possible to do this without additional taxation and without additional public debt, by wisely using the security afforded by the developing land values—the reclaimed lands and their products gradually paying the cost.

The future prosperity and comfort of great numbers of home-makers and an adequate supply of the necessities of life to countless citizens will follow the systematic continuance of the work thus begun of bringing together the landless man and "manless" land and making the union fruitful by the control of the otherwise destructive floods, storing and distributing the waters to the drought-stricken soil, or relieving the fertile swamp areas of the harmful excess.

At an inter-monthly meeting two weeks before, on April 9, at which President Greenough presided, Dr. Toyokichi Iyenaga addressed the Society on "Japan of Today." Dr. Iyenaga's late connection with the Department of Foreign Affairs of Japan and his present position as managing director of the East and West News Bureau fit him peculiarly as an interpreter of his country, and the lecture gave evidence of this qualification in a high degree.

NORTH AMERICA

The Biogeographical Contrast between the Coastal Plain and the Piedmont. The "fall line" has often been discussed in its economic aspect. Contrasted human environment on plateau and coastal plain has also been pointed out. A recent paper by Professor Spencer Trotter (*The Life Features of the Coastal Plain and the Piedmont Trans. Wagner Free Inst. of Sci.*, Vol. 8, 1917, pp. 33-44, Philadelphia), shows how this line has served as a frontier between the widely differing types of plant and animal life that characterize the Piedmont border and the low coastal lands. The author has sought to discover the underlying cause of such marked diversity in regions that lie side by side. The district about Philadelphia is selected as typical of this biological borderland. At this point, as in many places along the line that divides plateau from plain, the two types of life are in juxtaposition, yet each is well restricted to its respective zone. On the uplands just north and west of the city are found a fauna and a flora belonging, according to Merriam's classification, to the Transition type that separates Boreal and Austral life in North America, while on the lowlands immediately southeast the species of both plants and animals are distinctly Austral in character though far north of where such orders generally occur.

As regards the characteristic animal life of each zone it seems evident that it has become established there simply because of having found its accustomed vegetation

habitat. The point of greatest interest in the author's paper is his explanation of the sharply contrasted flora on opposite sides of the city. This is due not so much to difference in altitude or to the present difference in climate as to past geologic conditions. The controlling influences in the location of the so-called interior hardwood forest that characterizes the Piedmont border were the secular changes of climate that took place over the continent during and after the Glacial Epoch. Alternating periods of cold and warmth account for the present distribution of our northern and transitional forests, the latter being a remnant of the warm-temperate flora which in Miocene time enveloped even the circumpolar area, but which, in periods of lower temperature, found conditions in the north unsuited to its survival except on the borderland of the Piedmont. The principal factor in the development of a truly Austral type of flora along the coast so far north as Philadelphia was the gradual accretion of the coastal plain by the uplifting of the formerly submerged Atlantic seaboard. Upon these recently emerged lands the ground was occupied by plants from the south that found congenial soil in the sands and clays of the new-made territory. Thus the existing flora is due to causes reaching far back into geologic history. Such a perspective is essential in an understanding of the relation of the earth to the organic forms of today; it is necessary not only to consider the influences now operating, but also to recognize the very ancient impress of factors, which, originating in the distant past, have gradually produced our seemingly stable species and varieties of life.

Spring Cold Spells in New England. In Continental Europe a cold or frost spell believed to occur about May 10 is known as the "Ice Saints." A study of the long-period temperature records kept at New Bedford, Mass., between 1813 and 1905 by S. Rodman, Jr., and Thomas R. Rodman was made by the late Waldo E. Forbes, and published since the death of the author. The object of this investigation was to discover evidence for or against the occurrence of such a cold spell in New England (*Annals Astron. Observ. of Harvard College*, Vol. 83, Part I, 1917). The result of Mr. Forbes's analysis of the records may be stated briefly. The theory of the "Ice Saints" at present has little significance. Cold weather as well as hot weather may be expected on May 10, and hot weather as well as cold on May 7 or May 13. "It is nevertheless possible," the author concludes, "that when the pulsations of the weather are better understood, May 10 may prove to be a sort of node and may serve as a point of departure for the study of weather waves."

R. DEC. WARD

The Forests of the Isthmus of Panama. Since 1910 Dr. H. Pittier has been engaged in studying the flora of Panama for the general biological survey organized by the Smithsonian Institution. In the January, 1918, number of the *Journal of Forestry* (pp. 76-84) he briefly describes some of the results of his work in a paper entitled "Our Present Knowledge of the Forest Formations of the Isthmus of Panama." The continental divide separates Panama into two distinct vegetational regions, the rain-forest area of the Atlantic slopes, the savana and savana-forest of the Pacific side. The distinction follows the distribution of the rainfall, which in turn is dependent on the prevailing winds. The dominant northeast trades bring abundant rainfall, well distributed throughout the year, to the Atlantic slopes: the Pacific, on the contrary, is dependent for rain on the south wind, blowing irregularly from May to November, and thus suffers a long dry season. Panama City has an annual rainfall of 70 inches distributed through 180 days; Colon, with a low average for the Atlantic on account of its location in front of the great gap through the divide, has 129 inches per year in 246 days.

The evergreen rain-forest of the Atlantic slopes is characterized by its exceedingly varied composition. Up to the present 900 species of trees, not including shrubs and woody vines, have been listed. Save in the vicinity of roads and settlements the forest is entirely of primary origin. Its most complete development is attained on the alluvial flats of Darien. Such woodland as exists on the Pacific slopes west of the Panama Canal is best described as savana-forest, and it is more properly studied with the grass formations. East of the canal, that is in Darien, where rainfall becomes successively more abundant and better distributed, the forest changes to the type described by Schimper as monsoon forest. Its most distinctive tree is the *cuipo*, which here reaches its most northerly limit. It is unusually abundant and gregarious on the low hills of Darien in the Canal Zone. Eastward and southward the forest passes into the heavy rain-forest of the intensely humid Pacific coast of Colombia.

Little work as yet has been done on the forests of high altitudes. In the western part of the Republic of Panama where high altitudes are attained the evergreen oak becomes dominant above 8,000 feet, from which elevation it forms extensive groves up to the limit of the timber line.

The commercial prospects of the timber lands of Panama have been shortly described in an article by Forbes Lindsay (*Bull. Pan American Union*, Vol. 36, 1913, pp. 499-510).

EUROPE

Franco-Italian and Franco-Swiss Ports in France. Though Italy is developing the hydro-electric resources of her Alpine terrains, her industries are still largely dependent on imported coal. The pre-war import of coal amounted to some 10,000,000 tons, of which about 90 per cent came from the United Kingdom. To maintain the supply by the ordinary long sea route has become increasingly difficult, and relief has been sought in the establishment of a new route via the Gironde ports, whereby the sea journey has been reduced by more than three-quarters, and overland. A good deal of the diverted traffic is discharged at Bordeaux, but, to facilitate handling, a new modern port has been created out of the old and decaying harbor of Blaye on the right shore of the estuary. All transport equipment has been supplied by Italy, the dockers are Italians or prisoners of war, the French language has been replaced by Italian: to all intents Blaye has become an Italian town (Auguste Pawlowski: Blaye, Port Franco-Italien, *La Nature*, Jan. 12, 1918).

French hospitality has been extended to the neutral as well as to the ally. Her principal outlets, Hamburg and Antwerp, lost, Switzerland has turned for help to France. The port of Cette, 325 miles by rail from Geneva, has been put at her disposal. Unlike the state of affairs at Blaye imports in transit at Cette embrace almost the entire category of merchandise, except coal, which Switzerland gets from Germany. Food-stuffs naturally take first place, with wheat the chief single item (*idem*: Cette, Port Franco-Suisse, *La Nature*, Feb. 9, 1918; see also *Suppl. to Commerce Repts. No. 5a*, March 12, 1918).

The Internal Migrations Underlying the Present Distribution of the Serbo-Croats. Is race the great nation-making factor? Does ethnography supply the solution of the Balkan problem? This factor is at least one of profound importance—and profound difficulty. The complications of Balkan ethnography are apparent enough on the ordinary ethnographic map, but they become far more so when examined in such detail as is shown by Professor Jovan Cvijić in a recent paper on the racial migrations within the Balkan Peninsula (Les mouvements métanastasiques dans la péninsule des Balkans, with map showing the migration currents, 1:3,000,000, *Le Monde Slave*, July 1, 1917, Paris).

The Balkans have known no rest. Ignoring the racial diversity produced by movements of earlier epochs we still find great modifications arising from the migrations that have taken place continuously in the peninsula from the Turkish invasion of the fourteenth century to the present day. On these movements historic documents shed insufficient light. They recognize such great mass movements as that which towards the end of the seventeenth century carried 37,000 families from Kossovo beyond the Danube, but the smaller migrations involving perhaps only a few families are naturally unrecorded, though their succession has been continuous. But they live in tradition, and they may be read in customs, dialects, folk-names and even in written form in carefully preserved "family trees."

During the last twenty years Professor Cvijić and his collaborators have carried on a systematic anthropogeographic-ethnographic inquiry throughout the western and central parts of the peninsula, with the result that today the origin of the greater number of families in these regions is known and charted (the chart remains in a town of invaded Serbia).

The migrations whose courses have been thus determined influenced a great area, but most actively affected Serbia. They may be grouped into four main currents. The most powerful, denoted as Dinaric, carried peoples of the Syenitza region (between the Lim and Ibar Rivers) and of Bosnia and Herzegovina north, northwest, and west. One of the main branches led to a new peopling of the fertile area, the Shumadiya, between the Drina and Morava. This forest-clad country, isolated from Constantinople, always enjoyed comparative freedom and was the first portion of the peninsula to be freed from the Turkish yoke. The same migration continued across the swampy Morava valley and established itself in the mountainous districts of eastern Serbia. The direction, transverse rather than longitudinal along the great highways, is characteristic. Another branch crossed the Save and dispersed in Croatia-Slavonia. In its western and northern spread it even attained the confines of Laibach (Carniola) and Vienna. Today descendants of its members are said to form half the population of Croatia-Slavonia. A third, less important branch, following the transverse cols of the Dinaric Alps, reached the Adriatic seaboard, where their settlement was strongly encouraged by Venice, seeking to strengthen the Christian bulwarks against Islam.

Farther east originated the Kossovo movement, so designated from the principal area where it arose. Penetrating to the Morava valley again by transverse routes, the stream worked its way north, occupying successive portions of the valley. From western Macedonia and the Vardar a third great current also moved north, mingling with the Kossovo

current in the Morava valley. The fourth current, consisting of this combined flow, reinforced by the earlier inhabitants, proceeded across the Save and the Danube to settle in eastern Slavonia and the Banat. The total displacement effected is very great. In Serbia the old population forms only an insignificant part of the population of today. But at the same time overlapping and a certain degree of mingling must everywhere have contributed to ethnic confusion.

AFRICA

Commandant Tilho's Explorations in the Tibesti Region, 1912-17. The greatest blank on the current map of Africa is comprised by the Libyan Desert and its south-western border. According to Banse (*Der gegenwärtige Stand der Erforschung der Libyschen Wüste und Tibestis*, with map in 1:7,500,000, *Petermanns Mitt.*, Vol. 60, I, 1914) the extent of unknown desert, where never a European has laid foot, occupies an area not far short of 500,000 square miles. Besides the desert is the more elevated region extending northwest from Darfur and including Tibesti and the Borku plain to the west. For knowledge of Tibesti our sole authority up to today has been Nachtigal, who also visited Borku. During the first decade of this century French penetration into the territory east of Lake Chad was followed by military excursions into Borku and Ennedi (see F. R. Cana: *Problems in Exploration: Africa*, with map in 1:20,000,000, *Geogr. Journ.*, Vol. 38, 1911). Since the effective occupation of Wadai and Kanem that penetration has been continued, and now, in the report of Commandant Jean Tilho, we are presented with the geographical first fruits of its later development (*Exploration du Commandant Tilho en Afrique centrale: Borkou, Ennedi, Tibesti, Dar-Four, 1912-1917, La Géographie*, Vol. 31, 1916-17, No. 6-8, pp. 407-417).

In 1912 Tilho was appointed to Kanem, the country north and east of Lake Chad, with which lake his name is associated for his geographical labors during the mission of 1906-09 (see *Geogr. Rev.*, Vol. 1, 1916, p. 237). A vigorous campaign against the Senussi enabled him at the beginning of 1914 to start on the work of organizing and pacifying the territory described as Borku-Ennedi. Ennedi is the broken mountainous area 10,000 to 13,500 square miles in extent uniting Tibesti with Darfur. The greatest elevations do not exceed 5,000 feet. It is the home of small groups of restless, unsubmissive tribes. Borku is a confused mass of sandstone rocks more or less buried in sand. About half its population of 6,000 to 8,000 is entirely sedentary and lives on dates, a little millet and corn, and the milk of the small flocks of goats. Erdi near the frontier is a part of the Libyan Desert: it has no oases and date gardens but is the natural refuge of irreducible tribes—nomads of astonishing endurance and audacity. Not only do they prey on adjacent caravan routes, but they cross 400 miles of desert to raid the camels of Dongola and Kordofan.

While making his rounds of these regions Tilho was able to settle one of the last great hydrographic mysteries of Africa—the supposed relation between Lake Chad and the Nile. His earlier investigations of Lake Chad and the Bahr-el-Ghazal channel which connects with it (not to be confused with the Bahr-el-Ghazal of the Nile system) had favored the hypothesis of a connection between the lake and the great river (*Documents Scientifiques de la Mission Tilho*, Vol. 2, pp. 601-606, Paris, 1911). Now, however, this supposition has been disproved. Chad is a closed basin, and the present lake with the lakes of Wanyanga to the northeast are fragments of a former Central African system of lake and marsh that must at one time have covered an area as large as France.

Later reconnaissance in Tibesti yielded a rich harvest of geographical results. To the complete reversal of our previous ideas, instead of a simple mountain ridge running northwest-southeast Tibesti is resolved into four or perhaps even five chains radiating from south to west-northwest, north, and northeast—a sort of fan pivoted on the massif of Kussi. The volcano of Emi-Kussi presents several features of interest. The volcano attains an altitude of 11,100 feet. Its crater is of extraordinary dimensions, the axes being 5 and 7.5 miles respectively and the depth 130 feet. Within are two ancient vents; the orifice of the larger measures 1.5 to 1.8 miles. Covering over 120 acres of the crater floor is a deposit of natron, apparently of considerable depth in the center. This deposit with the salt of the Wanyanga lakes and indications of copper in the mountain zone suggest that the desert is not devoid of economic possibilities.

On the economic future of the territory lately under his control Commandant Tilho has an emphatic word to say; a more intensive railroad policy in collaboration with England must be prosecuted in the Sudanese zone. The first line to be built should be a great Franco-English road from Dakar, the port at Cape Verde, to Port Sudan on the Red Sea; today only the terminal portions of such a line exist. The line should follow the axis of the zone free from the tsetse fly, where cattle raising is practicable and to which products of the desert can be brought by camel, where the cultivation of millet,

cotton, and groundnuts flourishes and where there is in general a considerable native population. A railway would further permit relief to regions periodically famine-stricken. It is variously estimated that one-half to three-quarters of the inhabitants of northern Wadai died in the famine of 1914.

Among the scientific achievements of Commandant Tilho's five years' labors first place must be given to the cartographic results. His surveys embrace a band of territory previously unknown extending over 1,100 miles from northwest to southeast from the center of Tibesti to the neighborhood of El Fasher in Darfur. A large piece of the last great blank on the map of Africa is thus filled in. And this mapping, with its establishment of the vital points in the desert—the wells and pasturages—will be of supreme value both for military and civil ends.

A sketch map in 1:12,500,000 showing Commandant Tilho's journeys accompanies the account of his work published in the April, 1918, number of the *Geographical Journal*.

Rubber Cultivation in East Africa. Between the two great southern continents interrelations have been and are comparatively feeble. The most obvious connection between them is the debt of South American agriculture and more especially that of Brazil to African labor. But on the other side something must be placed to the credit of Brazil. Many of the cultivated plants that play so important a part in African economy that their foreign origin is forgotten came from the west. Manioc and maize now feed a great part of Africa: tobacco, the pineapple, the tomato, and the sweet potato are also widespread. These and others were brought from Brazil by the Portuguese in the sixteenth century. But with a list of the early Portuguese introductions the tale is not told. Recently introduced Brazilian products are today figuring among the economic resources of Central Africa. Ceará rubber is a striking example. This species of rubber-producing plant (*Manihot Glaziovii*, of the same genus as the manioc, *Manihot utilisima*) does not belong to the rain-forest, as does the better-known *Hevea brasiliensis*, but flourishes in such a semi-arid, bush country as the north-eastern corner of Brazil. Much of East Africa is occupied by country of a similar type in which the Ceará rubber is readily acclimated. All along the railroad from Dar-es-Salaam to Ujiji plantations of this tree are said to form a very noticeable feature of the landscape, while in the earlier developed eastern section, from the coast to Morogoro, the plantations are almost continuous (*Board of Trade Journ.*, Dec., 1917, p. 572). The Ceará species is short-lived and furnishes a rubber inferior to that of the *Hevea* (Pará rubber), but compensation lies in its hardihood and quick growth. It promises to be an ideal cultivation for lands formerly regarded as waste.

The Meteorological Station on the Island of Mauritius. The meteorological station on the island of Mauritius, in the Mascarene group east of Madagascar, is making some highly valuable contributions to our knowledge of meteorological conditions south of the equator. The Royal Alfred Observatory (20° 6' S. and 57° 33' E.) maintains a central station with many sub-stations. The island, 36 miles long by 23 wide, is divided into 13 districts coincident with the 13 principal river basins. Each district contains several observation places. The interior of the island is a rough mass of basaltic rock reaching heights of 3,000 feet. The relief creates local diversities of climate within the general oceanic habitus.

A secondary station which reports to the main station by cable is maintained 375 miles eastward on the island of Rodriguez. Vessels passing on their way to Indian ports also report their observations, thus making possible the correlation of data from a wide area.

The monthly bulletin of the observatory includes among other things a report on "the state of the sea at stations round the coast, to estimate the direction of the sea wave in connection with the study of cyclonic storms and extra-tropical gales." These waves are conspicuous features during the passage of a storm. At times they are very destructive, running far inland over the flat valley floors. They would be more destructive were it not for the coral reefs that surround the shore. The location of the storm center is determined by noting the direction and length of these waves.

Mauritius, like the West Indies and the Philippines, lies in the path of tropical cyclones, near the point where the disturbances turn southward away from the equator. Along the east coast of Africa these storms generally occur in the months of January, February, and March. The inhabitants of Mauritius have learned to expect them in February, near the close of what they call winter, though it is so called simply because it is the stormy season, for it is the warmest part of the year.

The character and movement of cyclonic disturbances are recorded in each monthly bulletin of the observatory. The tracks of some storms are mapped. The tropical cyclones often pass north of Mauritius and double back around Madagascar, going off toward the southeast. In December, 1916, two storms followed this course, sweeping

through the Mozambique Channel. One noted in January, 1917, crossed the northern end of Madagascar on the 26th, turned south through the channel on the 27th, and passed over southern Madagascar on the 28th.

Strange to say, extra-tropical disturbances are felt in spite of nearness to the equator. In November, 1916, a series of shallow highs and lows was observed, with an interval of about five days between successive maxima.

Incomplete records have been kept at Mauritius since 1875, while rather detailed descriptions of the hurricanes are contained in books of travel and in histories of the island. The "History of Mauritius" by Charles Grant (London, 1801) contains many such accounts, some of which date back to 1740.

Since January 1, 1916, the metric system has been used in all records made by this observatory. (For data on the station see the monthly *Results of Magnetical, Meteorological, and Seismological Observations* and the *Annual Reports of the Director of the Royal Alfred Observatory*.)

EDUCATIONAL GEOGRAPHY

Economic Geography in the High School. To the discussion of geography's place in present-day education Prof. J. Paul Goode contributes an article on economic geography in the February 23 issue of *School and Society* (A Course in Economic Geography, pp. 216-222). After briefly tracing the influence of such men as Guyot, Chisholm, and Cyrus C. Adams in the development of the science in this country the author presents what he considers to be the essential courses in high school geography. He advocates three units: "Elements of Geography," as a ground work for all later study; "Economic Geography," for the senior high school; and "Commercial Countries," as a regional treatment with which to complete the work. The first unit the author would require of every student. Of largest present interest Professor Goode finds the course in Economic Geography. In this study he would consider the "Commodities of Commerce" and the "Geography of Trade," attempting to show the geographic influences operating behind the scenery of international relations. Atlases, maps, pictures, lantern slides, and moving-picture films should be used as aids, while current periodicals, the *U. S. Commerce Reports*, special studies made by consuls and trade experts, together with the daily papers may be drawn upon to supplement the literature of formal textbooks for student as well as teacher.

In this scheme economic geography is emphasized, as being pedagogically the most telling phase of geography. A knowledge of human activities as influenced by physical environment is imparted in the Elements of Geography course. As to regional geography, what better way of becoming acquainted with the countries and people of the world, than considering them in connection with the things they contribute to the commerce of mankind? If care is exercised to see that geographic principles are stressed this should result in no lowering of standards.

To fully carry out this program would require at least three half-year courses. This is more than is accorded to geography in most high schools, but not more than the subject merits. The vastly wider field, politically and commercially, into which the United States is entering makes this an opportune time to secure for geography the recognition which it should have in American education. Giving the subject an economic trend should greatly strengthen its appeal to a public accustomed to think largely in terms of commercial expansion.

GEOGRAPHICAL NEWS

GRANTS have recently been made by the American Association for the Advancement of Science to Professor A. E. Douglass, of the University of Arizona at Tucson, to investigate the length of record of tree growth of the sequoias from about 2,200 to 3,000 years ago; to Professor Herman L. Fairchild, of the University of Rochester, for the continuation and completion of his studies on the post-glacial continental uplift in New England and the Maritime Provinces of Canada; and to Prof. S. D. Townley, of Leland Stanford Junior University, for the investigation of earthquake phenomena.

THE Museum Association and the Free Public Library of Newark, N. J., are holding an exhibition illustrating the resources and the social conditions of Colombia. The exhibition comprises representative samples of material now exported or imported from Colombia; notes on business methods suiting the conditions of South American trade; maps, political, commercial, geographical, and agricultural; pictures of buildings, city streets, factories, railway stations, docks, school houses, plantations, etc.; books and the newspapers and periodicals of the country; and samples of its products of all kinds,

including examples of the arts of the common people, home weaving, basket making, pottery, metal work, wood carving, etc., both ancient and modern. The exhibition will continue to October 31, except for a probable interruption in July and August.

PERSONAL

DR. L. A. BAUER of the Carnegie Institution on May 11 addressed the Philosophical Society of Washington on "Corresponding Changes in the Earth's Magnetic State and in Solar Activity, 1888-1916."

PROFESSOR W. M. DAVIS read a paper on "Recent Coast Survey Charts of the Philippines and Their Bearing on the Coral Reef Problem" at the April meeting of the American Academy of Arts and Sciences in Boston and at the annual meeting of the National Academy of Science in Washington.

DR. H. J. FLEURE, who has filled the professorship of zoölogy at the University College of Wales at Aberystwyth and has also acted as lecturer in geography, will henceforth occupy the chair of geography and anthropology recently created at the institution through an endowment of £10,500 by an anonymous donor. Professor Fleure contributed an article on "The Racial History of the British People" to the *March Review*.

MR. PHILIP A. MEANS, whose note in the December, 1917, *Review* on the Guaraní invasions of the Inca Empire will be recalled, is the author of a "History of the Spanish Conquest of Yucatan and of the Itzas" recently published by the Peabody Museum of American Archaeology and Ethnology of Harvard University.

PROFESSOR MARSHALL H. SAVILLE of the Museum of the American Indian, Heydon Foundation, of New York, is the author of "A Letter of Pedro de Alvarado Relating to his Expedition to Ecuador" in 1534, presented in facsimile and accompanied by a translation, notes, and bibliography, which has recently been published by the Museum.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

GENERAL

DALY, R. A. **Geology of the North American Cordillera at the forty-ninth parallel.** Part I: xxvii and 546 pp.; maps, diagrs., ill.; Part II: xxvii and pp. 547-857; diagrs., ill., index; Part III: maps and ill. in pocket. Introduction by R. W. Brock. *Geol. Survey of Canada Memoir No. 38.* Ottawa, 1912.

This memoir is a record of geologic work subsidiary to that of the International Boundary Survey. The field work occupied six seasons. A strip varying in width from 4 to 12 miles was mapped on a scale of 1 inch to the mile. The topography of most of this area is shown by contour lines at intervals of 100 feet. West of longitude 116° 30' the strip mapped lies wholly in Canada. East of that it laps over from 2 to 4 miles into the United States. An east-west structural section accompanies each map throughout the entire distance of nearly 400 miles. The report is primarily geological, but the following chapters are of geographic interest: Chapter 3, Nomenclature of Ranges, pp. 17-46; Chapter 21, Glaciation, pp. 577-598; Chapter 22, Physiographic Notes, pp. 599-642.

The nomenclature of these ranges has been in a state of confusion. Even the terms "Rocky Mountains" and "Selkirks" are given very diverse applications by different writers. Daly's attempt to reduce the naming to a consistent system [first published in the *Geogr. Journ.*, Vol. 27, 1906] is therefore highly welcome and it is to be expected that it will exert a great influence on future writings. It appears that on the whole a serious attempt has been made to abide by prevalent usage in so far as any usage can be said to be prevalent, provided only that the limits of the several ranges shall be determined by some good reason. It is aptly pointed out that the mountains along the International Boundary do not constitute distinct "ranges" in any such sense as do the mountains of Colorado and Wyoming. Almost the whole breadth of the Cordilleran belt in our northern states is filled with mountains, not very unlike in appearance throughout most of the distance. Under such circumstances Daly would make primary divisions by selecting as boundaries the largest and most continuous valleys. Of such valleys, four are deemed to be of the first order, two of them being styled trenches. A trench, in this sense, is defined (p. 26) as "a long narrow intermontane depression occupied by two or more streams (whether expanded into lakes or not) alternately draining the depression in opposite directions." The four first-rank valleys or trenches are here named in order, with the longitude at which each crosses the 49th parallel and the river which occupies it at that place: Rocky Mountain Trench (115°, Kootenay River flowing south); Purcell Trench (116° 30', Kootenay River flowing north); Selkirk Valley (118°, Columbia River); Okanagan Valley (119° 30', Okanagan River). The entire Cordilleran belt in latitude 49° east of Puget Sound is thus divided into five mountain systems, the Rocky Mountain, Purcell, Selkirk, Columbia, and Cascade systems. The "Rocky Mountains" are thus reduced to a belt about 50 miles wide lying east of Flathead Lake and the Kootenay River. Many will, no doubt, take exception to Daly's use of this term. In judging of any proposed nomenclature the chances of securing general adoption should always be taken into account. In this case the chances that any man or organized body can restore the name Rocky Mountains to its former narrow application are very small indeed. His emphasis on the term *Cordillera* for all the highlands between the Pacific Ocean and the Great Plains is well placed. A more general use of this term would save the words "Rocky Mountains" from some of the worst misapplications. The insistence on the Spanish pronunciation seems to us less wise. Webster's International Dictionary sensibly adopts the English. Insistence on a foreign pronunciation can only retard the general adoption of this much-needed term.

To the physiographer the most interesting part of this work is that which assails the position which peneplanes have held in the interpretation of mountain topography. A subequality of altitude among crests within a single view prevails throughout the entire

area, with the single exception of the Front Range in Glacier National Park. As approximate base leveling is affirmed by Willis for the first range west of this and since the Cascade Mountains have been pronounced an upraised and dissected peneplane by Willis, Smith, Russell, and others, it may safely be asserted that this would be the orthodox interpretation of the entire Cordillera in this latitude (perfection of peneplaning is of course not assumed). Daly combats this hypothesis and assumes on the contrary that high mountains tend to assume equal heights by the more rapid degradation of the higher crests. Thus accordance of heights is made incident to mountain degradation in its first cycle, and the two-cycle history is discarded. He finds reason to think that there has been a rather general uplift of several thousand feet in late Tertiary time, but this is treated as incidental and bearing no necessary relation to the accordance of crest heights.

The main objections to the two-cycle theory are (1) the absence of peneplane remnants, thus resting the whole argument for two cycles on accordance of crests; (2) the lack of stream adjustment; (3) the shortness of the time allowed for the making and destruction of the last peneplane when compared with the time which peneplanes elsewhere have endured. Under (1) the only high level surfaces deserving consideration are those of the Okanogan (Cascade) Range, and these Daly suspects to be determined by batholiths recently unroofed by erosion, but capable of other explanations also. Under (2) he finds the character of the drainage essentially the same from the Great Plains to Puget Sound, i. e. mainly consequent, with little or no subsequent drainage or adjustment to strong and weak rocks, even where contrasts of hardness are marked, unless some of the streams following fault lines may in part have selected these lines because of their weakness. He cites the well-known principle that adjusted drainage is one of the marks of second-cycle erosion. Under (3) he points to the fact that the Cascade peneplane is assumed to have been developed from a mountainous country since the beginning of the Miocene and by some writers since its close, then uplifted in the late Pliocene or possibly even early Pleistocene, since which time it has been (in the mountains) wholly destroyed. This rate of making and destroying peneplanes he thinks wholly out of proportion to that which is shown in the east by the well-preserved Cretaceous and Tertiary peneplanes, even allowing for the fact that alpine conditions must be assumed in the Cascades.

The constructive side of Daly's work appears in his provision for crests of uniform height through other means. He considers (1) isostasy, both during uplift and after its cessation; (2) the assumed regular forms of upper surfaces of batholiths and metamorphosed mountain cores; (3) cirque erosion; (4) influence of tree line, which is often not far from the cirque level (the tendency of mountain crests to be leveled to tree line and the cirque level was strongly stated by George Dawson in 1896); and (5) the subequal spacing of streams during maturity (Richter, Tarr, and others). Many processes are contrasted in their effectiveness above and below the tree line. He finds that all the mountains on the boundary show accordant summits at elevations very close to their "effective tree line" and concludes that many so-called peneplane remnants may owe their existence to the influence of the tree line rather than to that of base level.

Daly's general conclusions concerning accordant alpine crests and their explanation were published in the *Journal of Geology* in 1905. The present work adds discussions of concrete cases. Although these hypotheses have been before the geologic world for some years, no considerable tendency is observed among American physiographers to follow them. On the other hand, it is but fair to say that no other country is so wholly "addicted to the use" of peneplanes as is the United States. Apparently also the lack of stream adjustment in these western mountains deserves more consideration than it has received. So also does the great discrepancy between the assumed durations of erosion cycles in the Cordilleran and Appalachian belts. The tendency of crests to halt in their degradation at tree line and the cirque level is undisputed, but as yet no example of even crests due to this process is acknowledged by all physiographers. On the other hand there are unchallenged peneplanes even at mountain tops, as, for example, in the Front Range of Colorado. Indeed, the Rocky Mountain peneplane in Colorado assumes a role of some importance in considering the mountains farther north, for between South Park and southern Canada accordant crests are found so abundantly and at such short intervals that it would be difficult to say just where to begin to challenge the peneplane theory.

Daly has well remarked the need of quantitative work to determine the adequacy of forces which are well known to work in the direction of accordant crests. In the meantime, as between the two processes at issue, what can analytical, *deductive* study (such as Davis has so forcibly urged and so ably used) do to determine more exactly the sequence of forms involved in each method, with a view to determining criteria for discriminating between their results?

N. M. FENNEMAN

CANADA

Alberta, Saskatchewan, Manitoba

DENIS, L. G., AND J. B. CHALLIES. *Water-powers of Manitoba, Saskatchewan, and Alberta.* ix and 334 pp.; maps, diagrs., ills., bibliogr., index. Commission of Conservation, Toronto, 1916.

DOWLING, D. B. *The southern plains of Alberta.* 200 pp.; maps, diagr., ills., index. *Geol. Survey of Canada Memoir 93: Geol. Ser. No. 78.* Ottawa, 1917.

HINES, J. *The red Indians of the plains: Thirty years' missionary experience in the Saskatchewan.* viii and 322 pp.; maps, ills. Society for Promoting Christian Knowledge, London, 1915. 6s. 9 x 6.

MAWSON, T. H., AND SONS. *Calgary: A preliminary scheme for controlling the economic growth of the city.* xiii and 88 pp.; maps, diagrs., ills. Published under the auspices of the City Planning Commission of Calgary. Thomas Mawson & Sons, London, Lancaster, Vancouver, and New York, [1914]. \$2.00. 12½ x 10.

MITCHELL, A. E. *The mountain maze of the upper Athabaska.* Map, ills. *Travel*, Vol. 29, 1917, No. 4, pp. 30-33 and 45-46.

OLIVER, EDWARD. *Ninth Annual Report of the Secretary of Statistics for sixteen months ended April 30, 1916.* 58 pp.; map, index. Dept. of Agric., Province of Saskatchewan, Regina, 1916. [For reference to section on wheat crop see note in July, 1917, *Review*, Vol. 4, p. 58.]

ROSE, BRUCE. *Wood Mountain-Willowbunch coal area, Saskatchewan.* ii and 103 pp.; maps, ills., index. *Geol. Survey of Canada Memoir 89: Geol. Ser. No. 75.* Ottawa, 1916. [Abstracted in the March, 1917, *Review*, Vol. 3, pp. 241-242.]

TYRRELL, J. B. *Notes on the geology of Nelson and Hayes Rivers.* Maps, ills. *Trans. Royal Soc. of Canada*, Ser. 3, Vol. 10, 1916, pp. 1-27.

— *Alberta. Studies in duty of water and climatic conditions.* 1 in. to 42 mi. (1:2,600,000) approx. Irrigation Office, Dept. of Interior, Ottawa, 1913.

— [Four maps:] (1) *Alberta, Northern*, (2) *Southern Alberta*, (3) *Manitoba*, (4) *Saskatchewan [showing] Dominion electoral divisions.* 1:792,000. Dept. of the Interior, Ottawa, 1914 and 1915.

— [Three maps:] (1) *Alberta, Northern*, (2) *Southern Alberta*, (3) *Manitoba, showing disposition of lands.* . . 15th edit., corrected to January 1, 1917. 1:792,000. In 2 sheets. Dept. of the Interior, Ottawa, 1917.

— [Three maps:] (1) *Alberta, Southern*, (2) *Manitoba*, (3) *Saskatchewan, Cereal maps of, showing acreage under crop in each township in wheat, oats, barley, and flax during 1915.* 1:792,000, or 1 in. to 12½ mi. 4th edit. Railway Lands Branch, Dept. of the Interior, Ottawa, 1916.

— *Manitoba, Saskatchewan, and Alberta, showing the land registration and judicial districts.* Preliminary edit. 1:2,217,600. Compiled from information supplied by Provincial Governments. Railway Lands Branch, Dept. of the Interior, Ottawa, 1917.

UNITED STATES

General

SCHANZ, MORITZ. *Baumwoll-Anbau, -Handel und -Industrie in den Vereinigten Staaten von Nordamerika.* Bibliogr. *Beihefte zum Tropenpflanzer*, Vol. 15, 1915, No. 6, pp. 513-645.

The author is a member of the German colonial committee for the investigation of cotton, and his observations are the result of first-hand observations in the cotton states. The monograph is admirable in the presentation and arrangement of essential facts; there are few publications in English that give in brief compass so complete a view of the cotton industry in all its phases. Since most of the facts are readily accessible and more or less familiar to American readers, one's interest centers mainly in (1) what the author seems to regard as exceptional or distinctive and (2) his conclusions as to future conditions.

Our somewhat familiar demonstration agent (*Wanderlehrer*) of the U. S. Department of Agriculture is rightly accorded a high place in rural progress, although he is not known in Germany. On the other hand, two rural conditions are rightly criticized. The farm credit system is rightly described as almost unorganized, with a consequent high interest rate, in contrast, of course, to the efficient credit systems in many

countries of Europe. This criticism will probably not hold when the full effects of the Farm Loan Act of 1916 become apparent. The tenant share system and the changing uncertain supply of labor are rightly described as retarding the development of the cotton-growing South.

This expert observer is much impressed with the potentialities of the South. The soils, which are as a whole productive, and the favorable climate point in the author's opinion to a high agricultural prosperity, while iron, coal, and petroleum invite manufactures. The main retarding factor is a scarcity of skilled labor. In 1912 the cotton growing South produced 62.8 per cent of the world's cotton—a proportion which renders the textile industry dependent on American cotton. He notes that there is a distinct tendency in America to consume the home crop and to export cotton goods rather than to export raw cotton, and the only relief to European industry from "American monopoly" would be to raise cotton outside the United States. The author, however, does not express any expectation that this will be done nor does he suggest any means of increasing the production of cotton in other parts of the world.

The principal topics treated are: history of cotton; size of farms; land prices and farm leases; labor supply; farm credits; government organizations; soils and fertilizers; climate; seed and field cultivation; diseases and pests; harvesting; cotton seed and derived products; co-operative organizations; handling of the raw product; exports; retrospect and outlook.

F. V. EMERSON

— **Weather Bureau, Report of the Chief of the, 1916-1917.** 291 pp.; map. Weather Bureau, Dept. of Agriculture, Washington, D. C., 1917.

That the trained meteorologist is indispensable in the conduct of modern warfare has been abundantly proved by the importance of the part played by the weather forecasts made daily for the military commanders of the opposing armies in the great war. The weather conditions, from day to day, and from season to season, have had many and obvious effects upon general plans of campaign and upon the ordinary daily military operations, as has been pointed out in a series of articles by the present reviewer. It is therefore, natural that in his last *Annual Report* the Chief of the Weather Bureau Professor Charles F. Marvin, should emphasize the contributions which our own weather service has made, and is making, toward the effective carrying on of our part in the war. The immediate services which have been rendered are (1) the despatch to Europe of one of our foremost forecasters, who has been commissioned major in the Signal Officers Reserve Corps, and (2) the extension of the work of sounding the upper air for the benefit of aviators, balloonists, and artillerymen. The official in charge of the aerological investigations of the Bureau has also been commissioned a major in the Signal Officers Reserve Corps and, according to published newspaper statements, has also been sent abroad. In connection with our own meteorological work abroad, it is a satisfaction to note that "it is expected that the closest co-operation will exist with the French and English meteorological services in the use of data obtained by them, supplemented by additional observations in the field and cable reports from the United States and its possessions."

Many other activities of the Weather Bureau are given special mention by Professor Marvin. Among these a few may here be noted. The West Indian and Caribbean Service has been extended. Two daily observations are now taken from June 1 to November 30 and one a day for the remainder of the year. Plans have been made for more practical application of the results of free-air investigations to problems connected with aeronautics and the firing of projectiles. Work has progressed on the meteorological section of the new Atlas of American Agriculture. The precipitation section, consisting of 80 charts and diagrams and about 15,000 words of text, is in the printer's hands. The new Division of Agricultural Meteorology was established February 21, 1916. This department is to conduct "studies of every character of the relation of weather and crops" and to collect the statistical data required in such studies. It conducts investigations of the relations between weather and climate and the growth and yield of crops and in a general way supervises the activities of the Weather Bureau which have to do particularly with agriculture. It is not generally known that among the Weather Bureau's activities are included special storm warnings for sheep interests in Oregon, Washington, and Idaho; three- or four-day forecasts during the rice harvest in Arkansas; potato frost warnings in Colorado; special forecasts for alfalfa growers throughout the West; special frost warning service in the interest of fruit growers in several sections, and of cranberry growers in Massachusetts, Wisconsin, and New Jersey.

R. DEC. WARD

HARPER, R. M. **Some movements of state centers of population and their significance,** *Journ. of Geogr.*, Vol. 15, 1916-17, No. 7, pp. 227-231. [An interesting and

condensed note on the location of the centers of population in various states, and reasons for recent changes in location. The detailed sections are preceded by a useful summary of principles.]

MARVIN, C. F. **Organization of meteorology and seismology in the United States.** *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 768-779. Washington, D. C., 1917.

REED, W. G. **Frost in the United States.** Maps, diagrs. *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 593-631 (discussion, p. 631). Washington, D. C., 1917.

SNELL, B. H. **Mississippi River flood control.** Extension of remarks in House of Representatives, May 17, 1916. Extract from *Congressional Record*, p. 9392. Washington, D. C.

VOORHEES, J. F. **Climatic control of cropping systems and farm operations.** *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 127-132 (discussion, pp. 131-132). Washington, D. C., 1917. [Deals with the United States.]

WELLS, E. L. **The economic aspect of climatology.** Bibliogr. *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 240-249 (discussion, 247-249). Washington, D. C., 1917. Mainly with reference to conditions in the United States.]

North Atlantic States

MCADIE, ALEXANDER. **The winds of Boston and vicinity, Part II.** Maps, diagrs. *Annals Astron. Observ. of Harvard College*, Vol. 83, 1917, Part I, pp. 28-46.

The first part of Professor Alexander McAdie's "Winds of Boston and Vicinity" was reviewed in the February, 1917, *Review* (Vol. 3, p. 160). In this second part several general matters, essentially meteorological in character, are considered, such as the general circulation of the atmosphere and cyclonic theories. The author is of opinion that much has been written concerning pressure gradients in the equatorial regions which is not in accord with the temperature data and surface flow as given in the "Réseau mondial" for certain trade-wind latitudes. It seems more logical to begin with the falling masses of cold air in the polar regions than with the heating of the equatorial regions as the prime motive force in the general circulation. The more strictly climatological portion of the discussion concerns the relation of wet and dry seasons to the general pressure distribution over the North Atlantic. In warm winter months there is a decided increase in the surface flow of air from the southwest. This condition would result from a slight displacement of the Bermuda "hyperbar" westward and a displacement of the Atlantic "infrabar" eastward. (The terms *hyperbar* and *infrabar* were suggested by Professor McAdie in 1910, as being "more appropriate and distinctive" than the term "centers of action" introduced by Teisserene de Bort in 1881). In a wet spring month the Atlantic infrabar is displaced westward, and southerly winds prevail. In a dry spring month and also in a cold winter month the Atlantic infrabar is farther east, and an excess of northwest winds results. The purpose of the discussion is to lay the foundation for seasonal forecasts based primarily upon the flow of the larger air streams. It is found that the path and frequency of cyclones crossing New England are controlled by the prevailing flow from the west, modified by the north and south components of the general circulation.

R. DEC. WARD

ALLING, H. L. **Glacial lakes and other glacial features of the central Adirondacks.** Maps, diagr., ills. *Bull. Geol. Soc. of America*, Vol. 27, 1916, No. 4, pp. 645-72.

BARKER, E. E. **Ancient water levels of the Crown Point embayment.** Maps, diagrs., ills., bibliogr. *New York State Museum Bull. No. 187*, pp. 165-190. Albany, 1916. [Three maps show successive stages of the embayment during the northern retreat of the Hudson-Champlain glacier; a fourth map shows the approximate extent of the subsequent marine invasion and a fifth map the distribution of topographic related features and soil types.]

FAIRCHILD, H. L. **Post-glacial marine submergence of Long Island.** Maps, bibliogr. *Bull. Geol. Soc. of America*, Vol. 28, 1917, No. 2, pp. 279-308. [Presenting facts to "prove that the southern and the eastern plains were formed as a submerged marine plain."]

FARRAND, BEATRIX. **The National Park on Mount Desert Island.** Ills. *Scribner's Mag.*, Vol. 61, 1917, No. 4, pp. 484-494. [A popular description of the *Sieur de Monts* "Park" (though it should be said that it is officially named the *Sieur de Monts* National "Monument"), accompanied by good photographs. See note on this subject in the *Review*, Vol. 2, 1916, p. 375.]

FORD, W. C., edit. **Commerce of Rhode Island, 1726-1800.** Vol. II: 1775-1800. xi and 501 pp.; ill., index. (Massachusetts Historical Soc. Collections, 7th Ser., Vol. 10.) Boston, 1915. \$3.00. $9\frac{1}{2} \times 6\frac{1}{2}$.

GAGNON, ALPHONSE. **Le Vinland.** *Bull. Soc. de Géogr. de Québec*, Vol. 11, 1917, No. 2, pp. 114-119. [The conclusions of the author, identifying Vinland with the shores of Massachusetts or Rhode Island, are in close agreement with those reached by W. H. Babcock and stated by him at the last congress of Americanists held in Washington, December 1916. Cf. also his "Markland, Otherwise Newfoundland" in the October, 1917, *Review*.]

— **Sieur de Monts National Monument; The White Mountain National Forest.** 30 and 34 pp.; ill. *Sieur de Monts Publs.* 17. Wild Gardens of Acadia [Bar Harbor, Me.], and U. S. Dept. of the Interior, Washington, D. C., 1917.

SOUTH AMERICA

PARAGUAY, URUGUAY, ARGENTINA, CHILE

BELTRÁN, J. G. **Geografía de la Argentina, física, política y económica.** 332 pp.; maps, diagrs., ill. Cabaut y Cía. and A. García Santos, Buenos Aires, 1917. $7\frac{1}{2} \times 5$.

This is a textbook intended for the use of secondary schools, normal schools, and advanced students. As such it is meager and reveals the backward state of education in Latin America. The typography, text-maps, and illustrations are poor. Yet the work marks a distinct advance in geographical method for those countries. Instead of being limited to the bare enumeration of rivers, towns, ports, mountains, lakes, cities, etc., it contains a discussion of such matters as immigration, colonization, commercial and industrial development, transportation, and city growth. An occasional attempt is made to show the relation of man to his environment. Graphical representations are employed to illustrate density of population, amount of foreign trade, meteorological conditions, distribution of vegetation, and composition of the soil in different parts of the republic. The author's treatment of boundaries is almost entirely historical rather than geographical. The statement (p. 148, note) that atmospheric pressure increases with the amount of water vapor present is, of course, incorrect, as is also his assertion that pressure over the ocean is higher in summer than in winter. The reverse is usually true, the gradient however, being the decisive factor in the formation of winds.

In spite of these defects the book is of special value to the foreigner as it contains a wealth of up-to-date data regarding Argentina.

ARAÚJO, ORESTES. **Historia de los Charrúas y demás tribus indígenas del Uruguay.** Part I: *Etnología salvaje.* 142 pp. J. M. Serrano, Montevideo, 1911. 7×5 . [At the time of the Spanish discovery the Charruas resided on the northern shores of the Rio de la Plata.]

— **Argentine Republic: General descriptive data.** 31 pp.; map, ill. Pan American Union, Washington, D. C., 1917.

— **Chubut—one of Argentina's territories.** Ills. *Bull. Pan American Union* Vol. 44, 1917, No. 5, pp. 607-617. [Spanish version in *Bol. Unión Panamericana*, Vol. 45, 1917, No. 1, pp. 1-10.]

GROEBER, PABLO. **Informe sobre las causas que han producido las crecientes del Rio Colorado [Territorios del Neuquén y La Pampa] en 1914.** 29 pp.; maps, diagrs., ill. *Bol. Direcc. Gen. de Minas, Geol., e Hidrol. No. 11, Ser. B (Geol.)*. Minist. de Agric., Buenos Aires, 1916.

HUDSON, W. H. **The Purple Land: Being the narrative of one Richard Lamb's adventures in the Banda Oriental, in South America, as told by himself.** With an introduction by Theodore Roosevelt. x and 355 pp. E. P. Dutton & Co., New York, 1916. \$1.50. $7\frac{1}{2} \times 5$. [First published in 1885 as "The Purple Land That England Lost." A story of life in Uruguay.]

KEIDEL, J. **La geología de las sierras de la provincia de Buenos Aires y sus relaciones con las montañas de Sud África y los Andes.** 78 pp.; maps, diagrs., ill., bibliogr. *Anal. del Minist. de Agric. Sección Geol., Mineral., y Minería*, Vol. 11

1916, No. 3. Direcc. Gen. de Minas, Geol., e Hidrol., Buenos Aires. [The sierras of Buenos Aires Province are composed of Paleozoic rocks resting discordantly upon ancient crystallines. Their internal structure is attributed to movements taking place in late Paleozoic time. Such movements were separated by a long interval from the regional movements (Tertiary) to which the sierras owe their present elevation. Stratigraphically and tectonically they have close affinity with the Pre-Cordillera of San Juan and Mendoza, on the one hand, and with the Cape plateau of South Africa on the other. Their relation to the Andes may be compared with that obtaining between the ancient blocks of Europe and the folded Alps. The report is well illustrated with maps and diagrams and provided with a bibliography.]

MARTINOLI, GAETANO. **Cattle breeding in the Argentine Republic at the present day.** *Monthly Bull. of Agric. Intelligence and Plant Diseases*, Vol. 8, 1917, No. 8, pp. 1073-1084. Internatl. Inst. of Agric., Rome.

MORANDI, LUIS. **Frecuencia y modalidad de las calmas horarias en Montevideo, período 1906-1914.** 22 pp.; diagr. Inst. Nac. de Agronomía, Montevideo, 1915. [A study of air currents with special reference to their constancy as a source of power. Uruguay, being largely a land of plains and gentle slopes, is poorly supplied with water-power, but, the author thinks, should be able to make an extensive use of windmills. Land and sea breezes are felt far inland, and there are few hours of absolute calm, especially at an altitude of 25 meters above the ground. The data collected may be of value also in aviation.]

MORANDI, LUIS. **Resumen y discusión de las observaciones meteorológicas del Observatorio Central, período 1901-1915.** 19 pp.; ill. Inst. Nac. Físico-Climatológico, Montevideo, 1917. [Abstracted in the December, 1917, *Review*, Vol. 4, p. 488.]

ROSS, GORDON. **Argentina and Uruguay.** xv and 308 pp.; map, diagrs., ill., index. The Macmillan Co., New York, 1916. 9 x 6. \$3.50.

— **North Shore of the Plata River: Sauce Point to Martin Garcia Island. From British surveys in 1844 and 1856, with additions of Argentine surveys to 1911.** [1:84,000.] Inset: Sauce Harbor, 1:16,000. *U. S. Hydrogr. Office Chart No. 2703.* Washington, D. C., 1917.

— **Uruguay River: Juncal I. to Concepcion del Uruguay. From Argentine surveys between 1901 and 1910.** [1:100,000.] Inset: Guauguaychu River. *U. S. Hydrogr. Office Chart No. 2705.* Washington, D. C., 1917.

EUROPE

BALKAN STATES, INCLUDING RUMANIA

LEFEUVRE-MÉAULLE, H. **La Grèce économique et financière.** Preface by Paul Deschanel. x and 258 pp. Félix Alean, Paris, 1916. 3 fr. 50. 7½ x 4½.

Dealing principally with the natural resources of Greece, this book explains the country's economic position in the Near East. Its author has peculiar competence to write on these subjects in view of a long term of residence in the Levant as French commercial agent. This enables him to sketch in effective touches the possibilities of developing Greece's agriculture and industry. An excellent chapter on the territorial additions following the Balkan War shows how important was Greece's gain. To Saloniki and its value as a center of trade much space is devoted. The book will appeal to those who are interested in the new trends of Greek economic life after the war.

ALMAGIÀ, ROBERTO. **Note di cartografia albanese.** Maps. *Riv. Geogr. Italiana*, Vol. 23, 1916, No. 6-7, pp. 269-277.

DAINELLI, GIOTTO. **Quanti sieno gli Italiani in Dalmazia?** *Riv. Geogr. Italiana*, Vol. 24, 1917, No. 3-4, pp. 132-147.

DEDIJER, JEVTO. **La transhumance dans les pays dinariques.** *Ann. de Géogr.*, No. 137, Vol. 25, 1916, pp. 347-365.

DEDIJER, JEVTO. **Traces glaciaires en Albanie et en Nouvelle Serbie.** Map, diagrs. *La Géographie*, Vol. 31, 1916-17, No. 5, pp. 325-336. Paris.

MANETTI, CARLO. **Appunti sulla pastorizia albanese.** Ills. *L'Agricoltura Coloniale*, Vol. 9, 1915, No. 4-5, pp. 212-216. Florence.

NEWBIGIN, MARION. **Balkan outlets in the present and in the future.** *Geogr. Teacher*, No. 46, Vol. 8, 1916, Part 6, pp. 333-340.

NICULESCU, C. *Contributions à la géologie de l'Épire (environs de Janina)*. Diagr. *Bull. Section Sci. de l'Acad. Roumaine*, Vol. 3, 1914-15, No. 1, pp. 23-34. Bukharest.

PEDRAZZI, ORAZIO. *La Dalmazia e gli slavi del sud*. *Boll. Reale Soc. Geogr. Italiana*, Vol. 6, 1917, No. 4-5, pp. 270-282. Rome.

PERNICE, ANGELO. *Origine ed evoluzione storica delle nazioni balcaniche*. xii and 628 pp.; maps, bibliogr. Ulrico Hoepli, Milan, 1915. L.6.50. 8 x 5. [A guide to the history of the Balkan Peninsula, with a description of the geography of the area as a factor in its history.]

RICCHIERI, GIUSEPPE. *Il fato geografico nella storia della penisola balcanica*. Maps. *Boll. Reale Soc. Geogr. Italiana*, Vol. 6, 1917, No. 6, pp. 401-435. Rome.

STEBBING, E. P. *The Serbian front in Macedonia*. Map, ills. *Scottish Geogr. Mag.*, Vol. 33, 1917, No. 4, pp. 145-157.

STEFANO, SANTUCCI. *Un viaggio nell'Albania settentrionale*. Ills. *Boll. Reale Soc. Geogr. Italiana*, Vol. 5, 1916, No. 8, pp. 646-672; No. 9, pp. 749-777; No. 10, pp. 805-823. Rome.

WOODS, H. C. *Rumania and the Danube*. Map. *Asiatic Rev.*, No. 28, Vol. 10, 1916, pp. 373-381.

— *Balcani, 1916, L'intervento Europeo nei*. 1:1,500,000. Inset: I Rumeni della Transilvania e Ungheria. Istituto Italiano d'Arti Grafiche, Bergamo, 1916. [The boundaries of the Balkan states are those of the treaties of London and Bukharest, 1913.]

— *Balkan States, Map of the, showing communications to illustrate the paper by H. C. Woods*. 1:1,750,000, or 1 in. to 27.62 mi. Accompanies "Communications in the Balkans" by H. C. Woods, *Geogr. Journ.*, Vol. 47, 1916, No. 4, pp. 265-293.

— *Balkan area (Philips' large-scale strategical war map of Europe)*. 1:1,140,000, or 1 in. to 18 miles. George Philip & Son, Ltd., London, [1917].

ASIA

MANCHURIA, KOREA, JAPAN

MORSE, E. S. *Japan day by day—1877, 1878-79, 1882-83*. Vol. 1: xv and 441 pp.; diagr., ills. Vol. 2: 453 pp.; diagr., ills., index. Houghton Mifflin Co., Boston and New York, 1917. \$8.00. 9 x 7.

As many-minded as Ulysses, humorous as Aristophanes, learned as Darwin, and persuasive as Benjamin Franklin—such is the venerable professor who in his eightieth year delights an expectant world by publishing some notes made forty years ago in the Japan of semi-modern, semi-medieval aspect. These volumes are the work of a scientifically trained scholar who united the learning of an Agassiz or a Schliemann with the humorous charm of a Gilbert or a Mark Twain. We see him at one moment penetrating the mystery of prehistoric man in Dai Nippon, the next convulsing with laughter the gravest assembly in a country of cultivated gravity.

We frankly suspend criticism in treating of these precious volumes. We fall in love with the irrepressible boyishness of this learned graybeard. We love his book as we love Dr. Johnson—because of his faults no less than his virtues. Morse champions the worn-out Chinese and Turkish views on inoculation for smallpox along with a superstitious reverence for the Darwinian descent from monkeys. But what of that? Dr. Johnson was even worse; and we read and re-read him with delight. It is this quality of frankness, of enthusiasm, of explosive indignation, of profound erudition coupled with infinitely human sympathy and understanding that makes these volumes worthy of notice.

From a geographical point of view the work illustrates abundantly the close relation between the habits of a people and soil and climate that influence them. Many customs which Professor Morse was at first inclined to ridicule proved later to be the result of forces which he had not appreciated at the first glance. Indeed, rather than applaud Japan for her immense capacity for imitating "western" culture we are of opinion that time and reflection will cause her soon to discard many so-called reforms which, while suited to our conditions, are costly, cumbersome, and unsuited to a land whose physical characteristics have no parallel in any other part of the world.

POULTNEY BIGELOW

GJELLERUP, P. *Dagligt liv i Tokio i vor tid.* *Geografisk Tidsskrift*, Vol. 23, 1916, No. 6, pp. 237-243. [Daily life in Tokyo in our time.]

HANABUSA, NAOSABURO. *État de la population de l'Empire du Japon au 31 Décembre 1913.* [ix] and 335 and xxxviii pp. Bur. de la Statistique Générale, Cabinet Impérial, Tokyo, 1916.

— *Japon, l'Empire du, Exposé général des résultats du recensement de la population de, à la fin de 1913.* v and 179 pp. Bur. de la Statistique Générale, Cabinet Impérial, Tokyo, 1916. [In Japanese.]

MALAY ARCHIPELAGO, INCLUDING THE PHILIPPINES

ABENDANON, E. C. *Bijdragen tot de historische cartographie van den Ned. Ind. Archipel.* *Tijdschr. Kon. Nederl. Aardrijks. Genoot.*, Vol. 34, 1917, No. 6, pp. 862-877.

CRAIG, AUSTIN, and CONRADO BENITEZ. *Philippine progress prior to 1898.* 136 pp.; maps. (A Source Book of Philippine History, Vol. 1.) Philippine Education Co., Inc., Manila, 1916. 9 x 6½. [Part I discusses agriculture, industry, and commerce at the time of the discovery; commerce during the restrictive period of Spanish control and during the nineteenth century.]

MILLER, H. H. *Commercial geography: The materials of commerce for the Philippines.* 121 pp.; maps, diagrs., ills., index. Bureau of Education, Manila, 1915.

RINNE, F. *Reisebilder aus Java und Celebes.* Maps, ills. *Mitt. der Gesell. für Erdkunde zu Leipzig für das Jahr 1913*, pp. 99-118.

RUTTEN, L. *Reisherinneringen uit Zuid-Oost Boelongan (Oost-Borneo).* Map, ills. *Tijdschr. Kon. Nederl. Aardrijks. Genoot.*, Vol. 33, 1916, No. 2, pp. 236-253.

SHELFORD, R. W. C. *A naturalist in Borneo.* Edited with a biographical introduction by E. B. Poulton. xxviii and 331 pp.; ills., index. E. P. Dutton & Co., New York, 1917. \$5.00. 9 x 6. [Chiefly biological, but containing a chapter on the natives of Borneo and some discussion of the phytogeography and zoogeography of the island, by the late curator of the Sarawak Museum.]

SHERFEESE, W. F. *Annual report of the Director of Forestry of the Philippine Islands for the fiscal year ended December 31, 1915.* 91 pp.; maps. Dept. of the Interior, Manila, 1916. [Contains abstract of a forest reconnaissance of the Agusan Valley, northern Mindanao (pp. 52-60), accompanied by a map, 1:350,000. The original detailed report will be published in Spanish as a special circular.]

SWAAB, J. L. M. *De onderafdeeling Redjang der residentie Benkoelen.* Map. *Tijdschr. Kon. Nederl. Aardrijks. Genoot.*, Vol. 33, 1916, No. 1, pp. 57-69. [Sumatra.]

WALLIS, B. C. *The rainfall of Java.* Maps, diagrs., bibliogr. *Scottish Geogr. Mag.*, Vol. 33, 1917, No. 3, pp. 108-119.

WESTER, P. J. *The food plants of the Philippines.* Ills. *Philippine Agric. Rev.*, Vol. 9, 1916, No. 3, pp. 150-256. Manila. [Abstracted in the April, 1917, *Review*, Vol. 3, p. 326.]

— *Luzon, Southwestern, and Mindoro.* 1:400,000. *U. S. Coast and Geodetic Survey Chart No. 4714.* Washington, D. C., 1916.

— *Philippine Is. Cotabato to Sarangani Bay, South Coast of Mindanao. Surveys to 1916. Mindanao River region from surveys by U. S. Engineers in 1907.* 1:200,000. *U. S. Coast and Geodetic Survey Chart No. 4607.* Washington, D. C., 1917.

— *Philippine Islands, New library atlas map of.* 1 in. to 36 mi. (1:2,280,960). Insets: Manila and Vicinity [1:380,160]; Manila [1:26,400]; Batan and Babuyan Is. [1:3,168,000]; Concise Map of the Philippine Islands and the China Sea [1:15,200,000]. Rand McNally & Co., Chicago, 1913.

— *Philippine Islands: Palawan to Culion Island, including Linapacan Strait. Surveys to 1916.* 1:100,000. *U. S. Coast and Geodetic Survey Chart No. 4315.* Washington, D. C., 1917.

— *Philippine Islands, Southeastern Part. Surveys to 1916.* [1:800,000.] *U. S. Coast and Geodetic Survey Chart No. 4708.* Washington, D. C., 1917.

— *Puerto Princesa, East Coast of Palawan, Philippine Islands.* 1:40,000. *U. S. Coast and Geodetic Survey Chart No. 4343.* Washington, D. C., 1917.

— *Western Masbate, Philippine Islands.* [1:100,000.] *U. S. Coast and Geodetic Survey Chart No. 4412.* Washington, D. C., 1917.

PHYSICAL GEOGRAPHY

METEOROLOGY AND CLIMATOLOGY

PETTERSSON, HANS. **Meteorological aspects of oceanography.** Map, diagr. *Monthly Weather Rev.*, Vol. 44, 1916, No. 6, pp. 338-341.

The climatic effects of the ocean are widely recognized. Yet in weather forecasting but little practical application has been made of observations of the temperatures and movements of ocean water. The thermal functions of the ocean are the accumulation and redistribution of solar heat more evenly in time and space. Dr. Pettersson likens the ocean to a savings bank for solar energy, "receiving deposits in seasons of excessive insolation and paying them back in seasons of want." This bank "has a very extensive foreign exchange . . . the annual 'dividends' paid by this bank to its 'share-holders,' i.e. the continents round its borders, are emitted on a variable scale."

"Besides trying to predict the extremely variable state of the fickle atmosphere one should give more attention to the *conservative element* in meteorology, viz. the surface sheet of the ocean, where changes may be observed months before their effect on our weather becomes manifest." For example, "a sensible departure from the average value of the vast amount of stored heat carried through this [Florida] strait . . . might have profound effects on the weather of the following months both on the European and the North American continents" (cf. *Geogr. Rev.*, Vol. 2, 1916, pp. 249-255). Similar observations off the coasts of Formosa would no doubt be of corresponding value for predicting the weather of Japan.

Atmospheric circulation is particularly intensified in regions where a cold and warm current meet, as off Newfoundland, or where a warm current runs along the mountainous ridges at the edge of a winter continent, as near the northwest Scandinavian coast. Changes in air circulation intensity probably follow closely on the changes of water temperature. Furthermore, observations of water temperatures may be of aid in the daily forecasting because of the effects on storm tracks. The effects of changes in ocean temperatures on rainfall are not so definite as are those on temperature and winds, but it seems evident that a reduction of evaporation from the North Atlantic by an abnormal lowering of its temperature over large areas might presage a dry season.

CHARLES F. BROOKS

ARCTOWSKI, HENRYK. **The pleionian cycle of climatic fluctuations.** *Proc. 2nd Pan American Sci. Congress, Dec. 25, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 172-179 (discussion, pp. 177-179). Washington, D. C., 1917.

BARBATO, GERMÁN, JR., AND PEDRO ESQUERRÉ. **Iniciación al estudio de la relación heliometeorológica.** *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 561-570. Washington, D. C., 1917.

GALÁN, ANTONIO. **Fluctuaciones climatológicas en los tiempos históricos.** *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 475-481. Washington, D. C., 1917.

HUNTINGTON, ELLSWORTH. **Solar activity, cyclonic storms, and climatic changes.** Maps, diagrs., bibliogr. *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 411-431 (discussion, p. 431). Washington, D. C., 1917.

KIMBALL, H. H. **Measurements of solar and sky radiation.** Diagrs., ill., bibliogr. *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 549-561 (discussion, p. 561). Washington, D. C., 1917.

SHAW, NAPIER. **The meteorology of the globe in 1911.** Diagrs. *Quart. Journ. Royal Meteorol. Soc.*, No. 179, 1916, Vol. 42, pp. 137-152. [Noted in the *Review*, Vol. 1, 1916, p. 464.]

SMITH, J. W. **Predicting minimum temperatures.** *Monthly Weather Rev.*, Vol. 45, 1917, No. 8, pp. 402-407.

TAYLOR, G. I. **The formation of fog and mist.** Maps, diagrs., ill. *Quart. Journ. Royal Meteorol. Soc.*, No. 183, Vol. 43, 1917, pp. 241-268.

TOLLEY, H. R. **Frequency curves of climatic phenomena.** Diagrs. *Monthly Weather Rev.*, Vol. 44, 1916, No. 11, pp. 634-642. [Abstracted in the *September, 1917, Review*, Vol. 4, p. 222.]

THE GEOGRAPHICAL REVIEW

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No. 6

THE BELCHER ISLANDS OF HUDSON BAY: THEIR DISCOVERY AND EXPLORATION

By ROBERT J. FLAHERTY

[With separate map, Pl. IV, facing p. 440.]

In August, 1910, Sir William Mackenzie, president of the Canadian Northern Railway, engaged the writer to undertake a journey to the Nastapoka Islands, outliers of the east coast of Hudson Bay in $56^{\circ} 5' - 57^{\circ} 50' N.$, for the purpose of examining and reporting upon the commercial value of the iron-ore deposits found upon certain members of the group. Sir William's interest in these deposits was connected with his interest in the new Hudson Bay route for the shipment of grain from the Manitoba grain fields to the European market and the opening of the bay to commerce by rail with Lower Canada and by ship through Hudson Strait with England. The route¹ projected is from Le Pas, a branch line terminal of Sir William's transcontinental railway, to Port Nelson on the west-central coast of Hudson Bay, thence by ship through Hudson Strait and across the North Atlantic to Liverpool. This is a project which, if practicable—a matter still in question—is interesting not only because it would provide a wheat route shorter by a thousand miles than those now in use, but because it would also make immediately available such resources of the vast seaboard of Hudson Bay as might be found to be of commercial extent and of advantageous situation on or near tide water.

This seaboard bounds an area 1,200 miles long by 600 miles wide, 350,000 square miles of inland sea, and embraces the semi-arable hinterland of northern Ontario and northwestern Quebec, the semi-barrens of the Indians, the barrens of the Eskimos, and an arctic area of perpetual ice-bound sea. Nearly two-thirds of this region, indeed, lies within the subarctic and arctic zones of climate.

¹ For a full account see J. A. Cormie: The Hudson Bay Route, *Geogr. Rev.*, Vol. 4, 1917, pp. 26-40.

PREVIOUS EXPLORATIONS OF THE HUDSON BAY REGION

The white population of the region numbers some hundred and fifty fur men," factors of the Hudson's Bay Company and their apprentices. From their posts, six along the east coast and six along the west, two hundred miles apart on an average, they control the trade of the country's native inhabitants, who themselves number less than three thousand all told. Exploration of the "East Main," as the east coast is locally termed, on the part of the Hudson's Bay Company has, despite their two and a half centuries of occupation, been negligible. Under their trading system the native brings his furs to their posts along the seaboard and thus renders unnecessary any expeditions on their part for trade extension—expeditions which would, if made, inevitably involve a certain amount of geographical exploration. Of the score or more of rivers that flow into James Bay and Hudson Bay along the east coast only two have been explored to their sources. The largest river entering James Bay, the Big River, is not only unexplored to its source but is unknown beyond sixty miles from its mouth. The country's vacant spaces therefore can be imagined.²

For such information as we have of the coast and its interior we are indebted largely to the remarkable explorations of the late A. P. Low, of the Canadian Geological Survey, whose work, covering a period of more than twenty years, has given us the most detailed and reliable maps and descriptions of the region available.³ It was Low's detailed reports of the Nastapoka Island discoveries made in 1877 by Dr. Bell, also of the Canadian Geological Survey, that formed the basis of the investigations which I had been commissioned to make.

How this undertaking, involving three further expeditions extending over a period of six successive years, eventually led to the rediscovery, if such it may be called, of an island land mass more than 5,000 square miles in size, lying along the East Main almost within sight of sailing routes of the Hudson's Bay Company to the westward and within a hundred miles of the company's centuries-old post at Great Whale River to the eastward, is a matter of such interest that I give the incidents here just as they happened.

² See the note on "The Unexplored Areas of Continental Canada," with maps, in the *March Review* (Vol. 5, 1918, pp. 233-237).—EDIT. NOTE.

³ A. P. Low: Report on Explorations in James' Bay and Country East of Hudson Bay, Drained by the Big, Great Whale and Clearwater Rivers, Report J of *Annual Rept. Geol. Survey of Canada*, Vol. 3 for 1888, Montreal, 1888.

Id.: Report on Explorations in the Labrador Peninsula along the East Main, Koksoak, Hamilton, Manicouagan and Portions of Other Rivers in 1892-93-94-95, Report L of *Annual Rept. Geol. Survey of Canada*, Vol. 8 for 1895, Ottawa, 1896.

Id.: Report on a Traverse of the Northern Part of the Labrador Peninsula from Richmond Gulf to Ungava Bay, Report I of *Annual Rept. Geol. Survey of Canada*, Vol. 9 for 1896, Ottawa, 1898.

Id.: Report on an Exploration of the East Coast of Hudson Bay from Cape Wolstenholme to the South End of James Bay, Report D of *Annual Rept. Geol. Survey of Canada*, Vol. 13 for 1900, Ottawa, 1902.

Id.: Report on the Geology and Physical Character of the Nastapoka Islands, Hudson Bay, Report DD of *Annual Rept. Geol. Survey of Canada*, Vol. 13 for 1900, Ottawa, 1903.

INITIAL JOURNEY TO THE NASTAPOKAS

From the railway frontier of northern Ontario, in late August, 1910, journeyed by canoe down the Mattagami and Moose Rivers to Moose Factory on James Bay, thence in a small Hudson Bay sailing craft across James Bay to Fort George on the east coast, where, weatherbound, I remained until the formation of the sea ice in December (see map, Fig. 1). The journey up the coast was then undertaken with relays of sledges with dog team and native drivers; the first relay at Cape Jones, the northeastern extremity of James Bay, which marks the southern boundary of the subarctic habitat of the Eskimos; the second at Great Whale River, the most northerly post of the Hudson's Bay Company on the East Main, from which point a final 150 miles brought me to the Nastapokas—a distance all told from the railway frontier of 800 miles.

The Nastapoka Islands, ranging in size from a sea-swept reef to an island thirteen miles in length, are grouped in a chain for a distance of 120 miles at an average of four miles from the mainland, forming the spacious Nastapoka Sound. Save the southernmost they lie beyond the limit of trees and such vegetation as they contain—mosses, lichens, and creeping willows—is typically subarctic. The largest of the ore deposits are located on the two central islands of the group, Gillies and Clarke, which are 12 and 3½ miles in length respectively. Their eastern shore line is broken into a series of cliffs rising, according to Low, to a maximum elevation of 350 feet, where the various rock members are everywhere graphically exposed. These rocks have been identified by Dr. C. K. Leith, of the University of Wisconsin, as of Animikean age. His identification he bases on a correlation with the Animikean rocks of the Lake Superior region, and its interest, economically considered, lies in the fact that it is to these Animikies and the enormous mineral deposits characteristically associated with them that the Lake Superior region in great measure owes its commercial importance.⁴

REPORTS ABOUT THE BELCHER ISLANDS

The examination of Taylor and Gillies Islands completed (the ore deposits were found to be of no present economic interest), I prepared to return to the railway frontier. It was at this juncture that Nero, my

⁴ Dr. Leith, who is a well-known authority on the geology of northern Minnesota and Michigan, made his examination of the Nastapokas during the summer preceding my own journey. His paper gives an excellent description of the island formations; his conclusions, offered tentatively owing to the limited time he had for investigation, he summarizes as follows:

"From an economic standpoint the repetition of essentially Lake Superior conditions in the Hudson Bay country cannot but be of interest, . . . when it is remembered that the enormous deposits of iron, copper, nickel, and cobalt on the south side of the Archean protaxis are, with very few exceptions, associated with Algonkian rocks, and late Algonkian at that, rather than with Archean rocks. There are yet no discoveries to warrant close commercial comparison of the two regions." (C. K. Leith: *An Algonkian Basin in Hudson Bay—A Comparison with the Lake Superior Basin*, *Econ. Geology*, Vol. 5, 1910, pp. 227-246; reference on p. 246.)

For the narrative of the journey, which gives a good insight into the human geography of the region, see C. K. Leith and A. T. Leith: *A Summer and Winter on Hudson Bay*, 203 pp., Madison, Wis., 1911 (reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, p. 770).

driver, one of the only two Eskimos of the seaboard who could speak English, mentioned large islands to seaward of the Nastapokas, where lived a tribe of Eskimos whose hunting ground contained great walrus herds, thousands of geese in spring, salmon, seal, bear, etc.—game supply being to a native the only characteristic of a strange land worth consideration. I remembered then, for the first time since leaving Charlton Island *en route* northward in the preceding fall, a map and interesting information I had received there concerning these same islands from a servant of the Hudson's Bay Company, an Eskimo, Wetalltok by name, head man of the encampment, whom the company had imported from the Great Whale seaboard some fifteen years previously. The map (Fig. 4), drawn on the reverse side of an old missionary lithograph, represented Wetalltok's hunting grounds previous to his migration—islands which on the admiralty charts (Fig. 2) are known as the North and South Belchers, shown there in dotted outline, the largest of them not more than six miles long.

The data for this rendering of the East Main islands on the admiralty charts⁵ are taken from the maps and descriptions of Captain Coats, a noted shipmaster in the employ of the Hudson's Bay Company from 1727 to 1751. That Coats relied largely on Eskimo accounts for his notes is apparent from the following statement of his:⁶

Belchers Islands, four in number, lyes forty-five leagues to westward of Little Whale River; by another account, only twenty-nine leagues in latitude $56^{\circ} 06'$, where I was entangled three days in ice. I found a flood and ebb setting due east and west; but we drove to eastward most. I have made a computation of about four and a half miles a day. This increment to eastward, which is owing to those vast quantities of snow, which dissolves and drains down our rivers from the western shore, amongst whom is good anchor ground.

About seven leagues north from those is a range of islands twenty leagues in length, fourteen larger, and many smaller; the middle, in $58^{\circ} 00'$ N. latitude, at a distance of seventeen leagues from the east main, amongst which the Usquemows swarms all the summer months to catch fish and moulted fowl, in great abundance, upon all these, Belchers and Sleeper islands. In latitude $59^{\circ} 05'$, we told fourteen islands in sight; and, by my account, the westernmost is upon the same meridian of the North Bear; and the North is $2^{\circ} 50'$ west longitude from Cape Diggs; and Gulph Hazard lyes $2^{\circ} 05'$ east longitude from Cape Diggs in $56^{\circ} 22'$ north latitude.

Wetalltok's map, on the other hand, showed a land mass of surprising extent. Calculating distances from point to point by Wetalltok's reckoning, i. e. travel time for kayak and dog team, we judged that the main island could hardly be less than 100 miles in length. That a land mass of such extent, however, could exist not a hundred miles to seaward of the centuries-old post at Great Whale River and remain unknown to the Hudson's Bay Company seemed to me altogether improbable, as it did also to the company's men to whom I mentioned the affair at the time—particularly

⁵ Cf. Hudson Bay and Strait, British Admiralty Chart No. 863, mean scale 1:2,100,000, published 1884; 5th edition, 1910.

⁶ John Barrow, edit.: *The Geography of Hudson's Bay: Being the Remarks of Captain W. Coats, etc.*, Hakluyt Soc. Publ., 1st Series, Vol. 11, London, 1852, p. 66.

improbable to them, since the islanders migrate across the field ice once a year to trade at Great Whale River Post and consequently are not unknown to them.

Low in one of his reports⁷ refers to a projected exploration of the Belcher Islands that was not carried out. Probably he, too, had received interesting

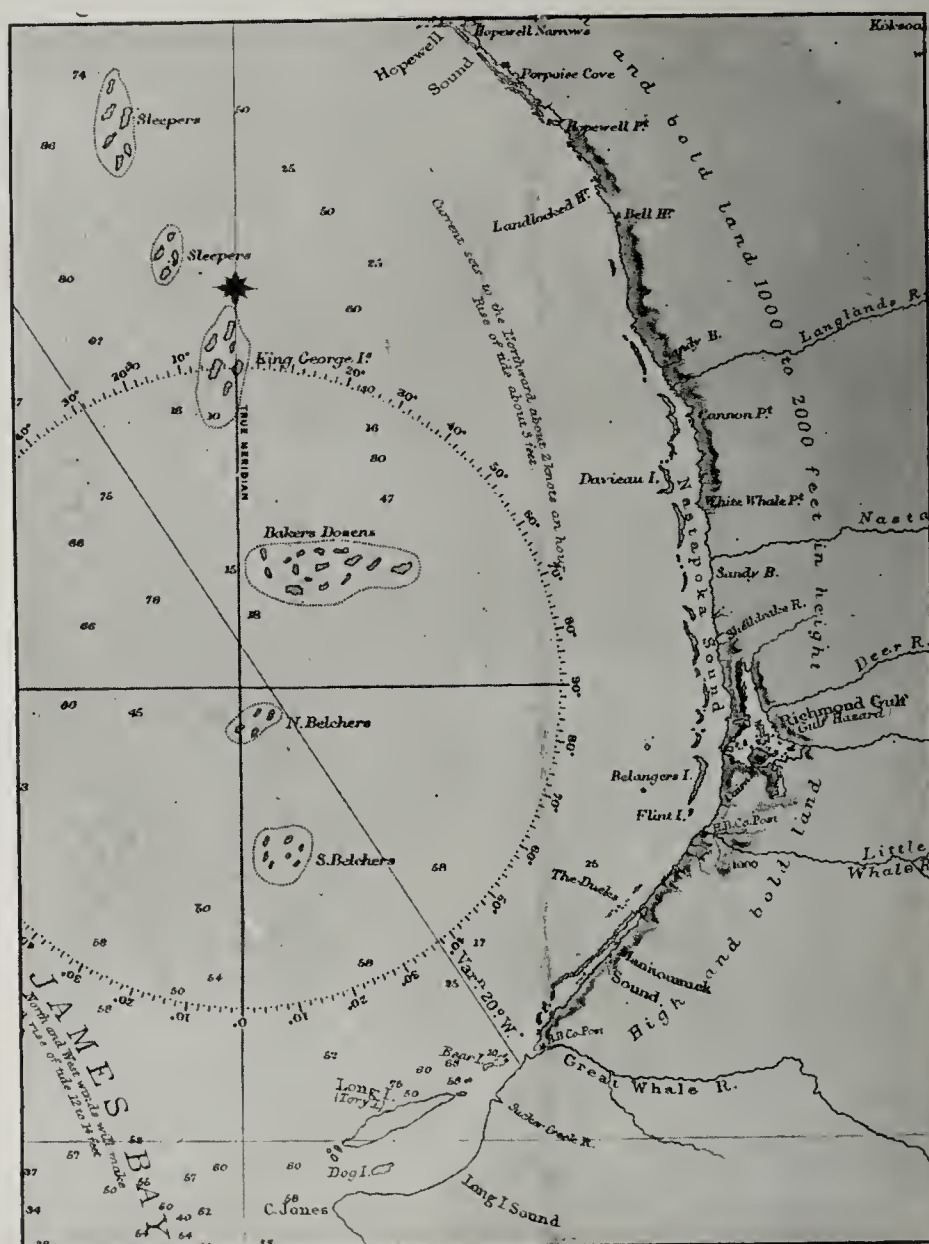


FIG. 2—Section of British Admiralty Chart No. 863 ("Hudson Bay and Strait," mean scale 1:2,100,000, published 1884, 5th edition, 1910) showing current representation of the Belcher Islands. Scale of this reduction, 1:3,300,000.

information from the natives concerning them. The reference is of interest as evidence of the ice conditions that may obtain in the bay during the summer months.

At Great Whale River we were again delayed by ice until the 7th of July, when we were advised by all the Eskimos to abandon our proposed trips to the Belcher islands which lie about seventy miles off the coast and about which, owing to the prevalence of

⁷ The fourth listed in footnote 3; reference on p. 41.

westerly winds during the early summer, the ice would be very thick. This advice proved correct as the Hudson's Bay Company's ship "Lady Head" was beset with heavy ice as far south as Bear Island in James Bay, where the ice was left on the 20th August.

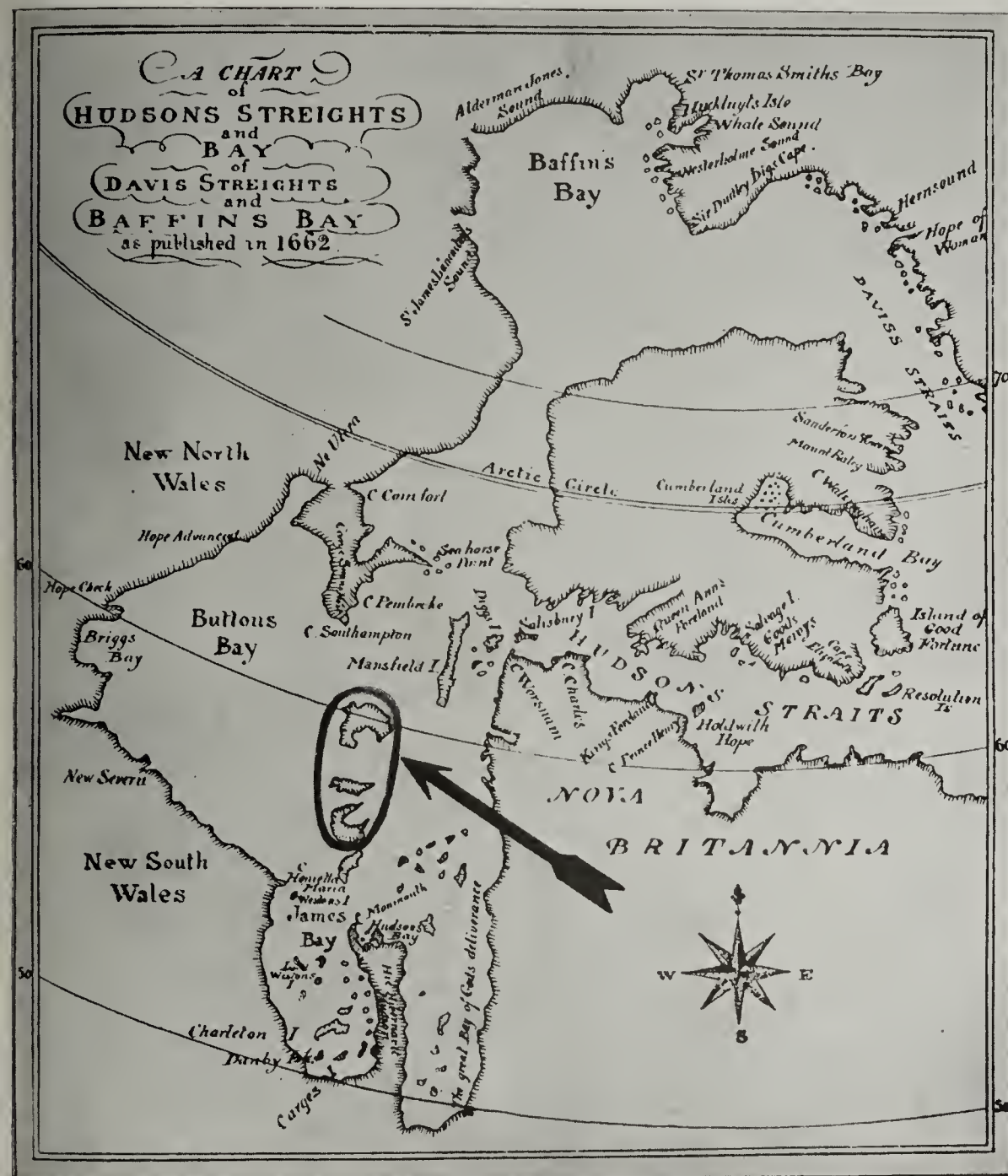


FIG. 3—Copy of a portion of a map from Drage's "An Account of a Voyage For the Discovery of a North-West Passage by Hudson's Streights . . . Performed in the Year 1746 and 1747," 2 vols., London, 1748-49, showing Hudson Bay and Strait as represented in 1662. Note the large islands in the east-central part of the bay.

Probably, also, he had in mind Dr. Bell's remarks on certain rock specimens supposed to have been broken from the fixed rocks of the Belchers and his belief that these specimens indicated the extension to the Belchers of the Nastapoka series.⁸

⁸ Robert Bell: Observations on the Geology, Zoölogy, and Botany of Hudson's Strait and Bay, made in 1885, Report DD of *Annual Rept. Geol. Survey of Canada*, Vol. 1 for 1885, Montreal, 1885, p. 14.

The islands further out to sea, opposite to this part of the coast, are also believed to consist of rocks of the Manitounuck [Nastapoka] group. Specimens, said to have been broken from the fixed rocks of the Belchers, opposite Little Whale River, were obtained

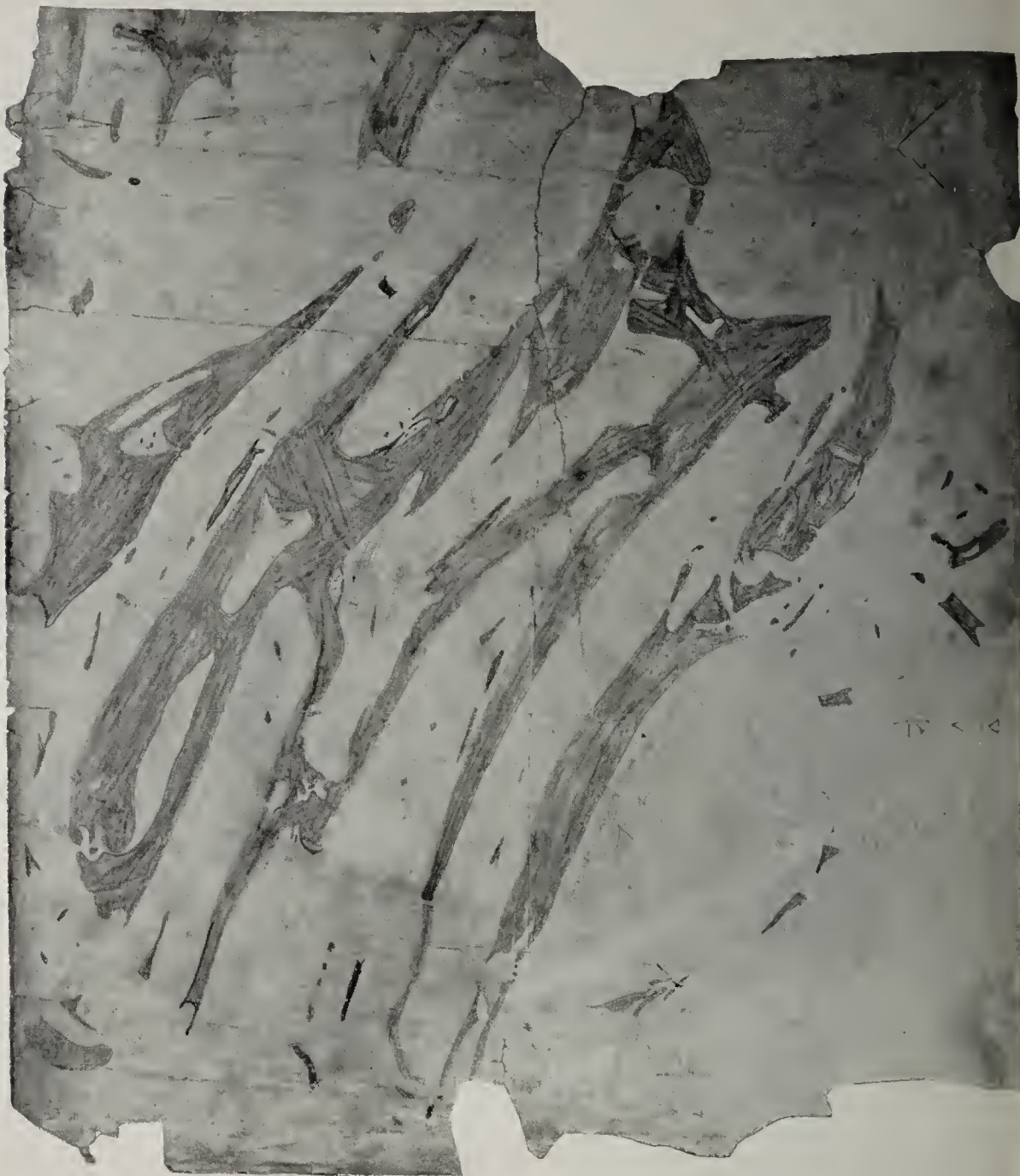
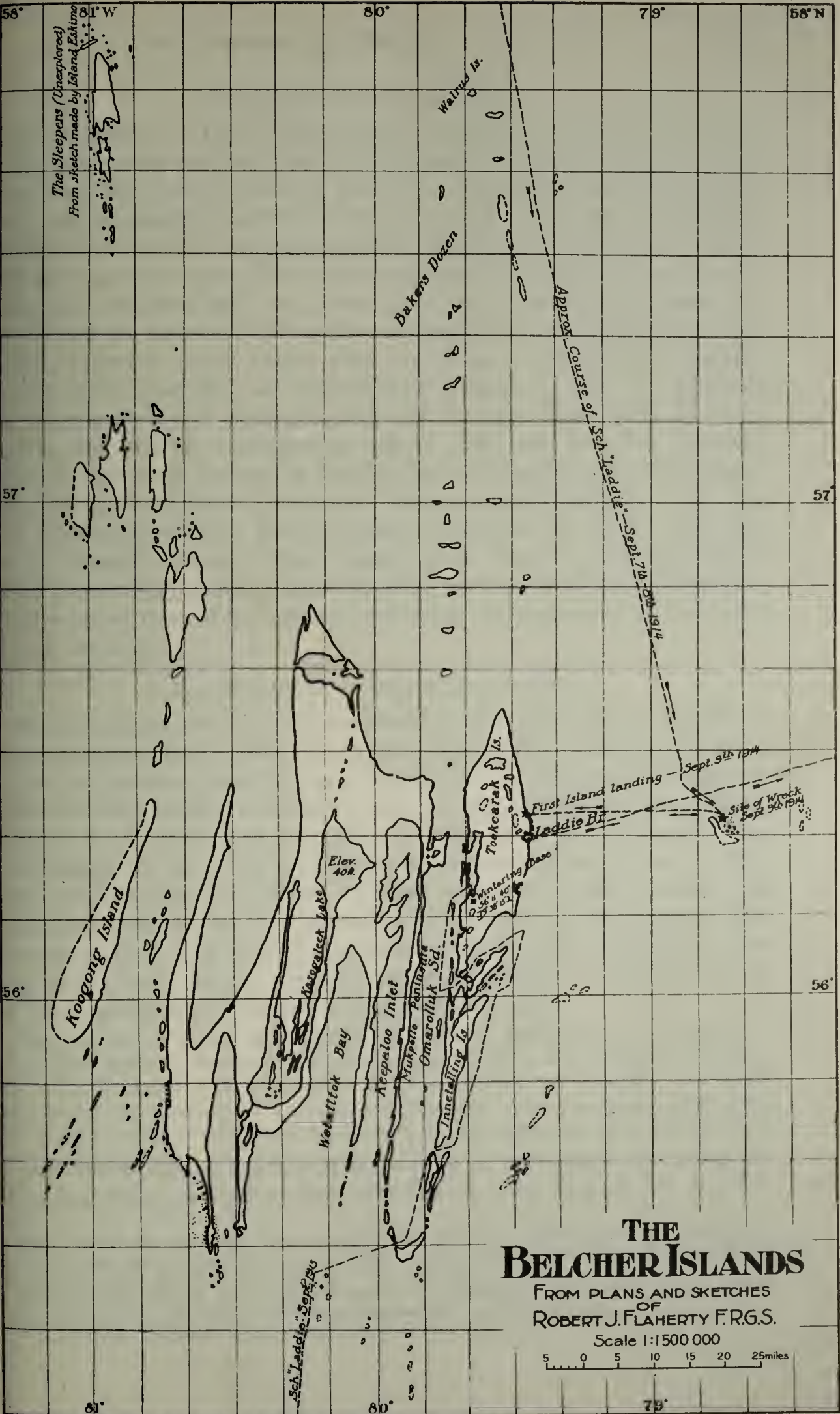


FIG. 4—Facsimile of a map of the Belcher Islands by Wetalltok, an Eskimo. The original is drawn in pencil on the back of an old missionary lithograph and measures $13\frac{3}{4}$ by $12\frac{1}{4}$ inches. Comparison with the true outlines opposite (Pl. IV) shows how remarkably accurate the Eskimo map is. In its grasp of the intricacies of the island system this map is a specially noteworthy example of its kind. For some other Eskimo maps see "Narrative of the Second Arctic Expedition Made by Charles F. Hall," edited by J. E. Nourse, U. S. Naval Observatory, Washington, 1879, facing pp. 351 and 354 (eastern coast of Fox Basin), and F. Boas' "Central Eskimo," *6th Annual Rept. Bur. Amer. Ethnol. for 1884-85*, pp. 643-647 (Cumberland Sound and Frobisher Bay, Baffin Island).

at my request from the Eskimo and are found to consist of amygdaloid, white and grey dolomite, a soft grey schist, and columnar calespar, the last named apparently from a thin vein.



THE BELCHER ISLAND ESKIMOS

On the return to Great Whale River I questioned Harold, post interpreter, concerning the post trade with the island Eskimos and learned how every year the islanders, crossing the sea ice, bring bear, seal skins, walrus ivory, and fox skins to barter for tobacco, tea, sugar, matches, bits of finery, powder and shot, and a gun perhaps, if by good fortune there is a "silver" (fox skin) among them. They cross when the ice fields, the largest area of fixed ice in Hudson Bay, are frozen so as to be immovable between the islands and the mainland during the extreme cold months of February and March, a period rarely longer than six weeks. During the remaining months of the year they are isolated from intercourse with the mainland. Harold described how distinctly they differed as a tribe from the mainlanders, not only as to costume in winter, when they wear the feathered skins of eider ducks in place of the mainlander's deerskin, but in speech as well; which, he explained, was more "like the talk of children." He told how primitive they were and how poor as hunters—the latter a damning fault in Harold's Hudson's Bay Company eyes. Harold estimated that the island population numbered some 150 souls, thus corroborating information I had received from Wetalltok and confirming my impression of the extent of their territory.

UNCERTAINTIES OF THE EARLY CHARTS

On the earliest charts of Hudson Bay several large islands, sometimes three, sometimes four, appear, occupying conspicuously either the center of the bay or a position nearer the west coast (Fig. 3). These islands evidently originated with Hudson's own chart of his voyage of discovery into the bay in 1610. In the journal of the voyage by Prickett⁹ we are told that leaving Cape Digges on the north the expedition, southward bound for "a more genial climate wherein to winter,"¹⁰ wandered about for three months "in a labyrinth without end." The islands disappear from the charts at least as early as 1709, and various explanations for Hudson's delineation have since been given. Burpee, for instance, in his chapter on the discovery of the bay,¹¹ speaking of Hudson's voyage and chart says:

The chart shows several large islands lying off the western coast of Hudson Bay between 56° and 60°. From Roe's Welcome in the far north to the foot of James Bay, only two large islands lie off the western coast, Marble Island and Akimiski. The former being out of the question, we are reduced to Akimiski. That convenient island seems to be a peg on which to hang every theory of the fourth voyage that defies other solution.

Now, supposing the Belchers to be as large as represented, here, after all, was a land mass, as large as Mansfield Island, lying between 55° and 58°

⁹ In "Purchas, His Pilgrimes," 5 vols., London, 1625. Prickett's journal is in Vol. 3, pp. 597-609; see pp. 600-601. The journal is reprinted in "Henry Hudson the Navigator," edited by G. M. Asher, *Hakluyt Soc. Publs.*, 1st Series, Vol. 27, London, 1860, pp. 98-135; see p. 110.

¹⁰ Paraphrasing Prickett, these words are used by J. J. Shillinglaw in his excellent "A Narrative of Arctic Discovery From the Earliest Period to the Present Time," London, 1850, p. 88.

¹¹ L. J. Burpee: *The Search for the Western Sea*, New York, 1908, p. 21.

in approximately the latitude of Hudson's islands. Might they not, then, present a solution of the problem at least as reasonable as any of those already put forward? Supposing, also, Dr. Bell's belief as to the extension to the islands of the Nastapoka rock series to be true, and the native representations as to their size to be even approximately correct, here, indeed, was a field of promise in the economic sense and a fascinating one as well from an ethnological and geographic point of view.

THE SECOND EXPEDITION

By June of the following year, 1911, the expedition was under way. I again arrived, this time by the Missinaibi route, at Moose Factory and there secured a thirty-six foot sailing craft for the cruise to the islands. To make a long story short, our little craft proved inadequate for the work in hand, and we arrived at Great Whale River post too late to impress a crew for the crossing. Wintering at Fort George, therefore, I waited eight months for an opportunity to cross over the sea ice from Great Whale River, but was again doomed to disappointment when, on the point of making departure with two Eskimos, the field ice broke, disrupted by an extremely heavy gale, an occurrence unique in the twenty-eight years of old Harold's experience.

All thought, therefore, of reaching the islands was abandoned for the remainder of the winter and until the following open season. Whereupon, following an idea that had been shaping itself in my mind, I planned to explore an ore-bearing rock series, similar in character to the Nastapoka series, reported by A. P. Low as occurring along the lower reaches of the Koksoak River in northeastern Ungava, 100 to 150 miles inland from Ungava Bay. I hoped to find an extension of that series farther north on or near tidewater of southwestern Ungava Bay. The undertaking involved two traverses across northern Ungava through the hitherto unexplored portion of the peninsula; the first by sledge along the 57th to the 59th parallels eastward from White Whale Point on Hudson Bay to Leaf Gulf on Ungava Bay; the second by canoe along the 60th parallel westward from Payne Bay on the Ungava seaboard to the mouth of the Povungnituk River on Hudson Bay. The second traverse was undertaken only when I found that the return journey I had planned ascending the Koksoak River to the height of land, thence by the headwaters of the Great Whale River to Hudson Bay, would, in any event, owing to the unusually late break-up of the Koksoak River, bring me too late on the Great Whale seaboard for the crossing I had intended making that summer to the islands.¹²

THE THIRD EXPEDITION

So it happened that in October, 1912, a year and seven months after leaving civilization, I again arrived in Lower Canada with the expedition

¹² An article by the writer on his two traverses of Ungava Peninsula will appear in a forthcoming number of the *Review*.—EDIT. NOTE.

to the Belchers still unaccomplished. However, with a persistence altogether characteristic, Sir William said, "Get a ship." This meant outfitting on an adequate scale at St. Johns, Newfoundland, and proceeding through Hudson Strait and southward along the eastern coast of Hudson Bay. Accordingly the topsail schooner *Laddie*, of 83 tons register, was purchased from Captain Sam Bartlett, the well-known Arctic navigator of Brigus, Newfoundland. Captain H. Bartlett was put in command. The crew were: S. Gushie, mate; H. Spracklin, boatswain; McLeary, engineer; W. Robertson, cook; and R. O'Leary, K. French, and J. Robertson, seamen. S. Sainsbury and E. E. Laduke completed the personnel of the expedition.

Though we cleared St. Johns on August 17, 1913, it was not until a year afterward, late August of 1914, that we finally put into the bay. This was on account of our delayed departure from Newfoundland, which brought us so late into the strait that we were stopped there by winter. Winter quarters were erected in Amadjuak Bay on the south-central coast of Baffin Island, and the ship was sent back to Newfoundland with orders to return the following year over the first open water. During the year we carried out explorations along the seaboard. An attempt was made to explore the unknown coast line of Fox Channel;¹³ but an inadequate outfit and impassable rough ice made the project impossible, and at the Trinity Islands, 35 miles west of Cape Dorset, we were turned back. A small portion of the interior of southern Baffin Island was explored as far north as Amadjuak Lake. We compiled an ethnological collection for the Royal Museum of the University of Toronto, and with a motion picture outfit filmed the travel and igloo life and some of the religious performances, conjuring, and dances of the Baffin Island Eskimos.

The *Laddie* was six weeks *en route* to our relief, having encountered heavy ice all along the northern Labrador coast and at the entrance to Hudson Strait; in the strait she was nipped in a heavy ice stream which came near sinking her. On the 19th day of August, when we were living on the fag ends of our provision supply, she finally arrived, somewhat bruised at the bow and with a bent propeller shaft, but not beyond repair; and on the 23rd of August we set sail for Hudson Bay.

ARRIVAL AT THE ISLANDS

From Cape (Sir Thomas) Smith a course was laid due south and off shore some seventy miles. In latitude 59° we encountered thick, foggy weather, which was continuous to 56° 30'. We had sighted small islands, barren, low masses of trap, all of them less than two miles in length, whose outlying waters were shoal and infested with innumerable reefs. Fearing accident, toward nightfall of September 8, the ship's course was laid to

¹³ All such attempts are to be welcomed, as, for the representation of this not inconsequential feature of Arctic geography, we are still dependent on the Eskimo maps of 1868 procured by Hall on his second expedition. Cf. title of Fig. 4.—EDIT. NOTE.



FIG. 5.—Wintering base on Bolshoi Island, May 15, 1916. View looking westward across Ocean Bay.



FIG. 6—The northwestern part of Tookcarak Island: looking along the strike of the rocks. Exposure of marl in the foreground.

eastward for sea room over night, but within the hour she grounded on a sunken shoal, where she pounded heavily through the night. When daylight came we made out through the lifting fog a small island a half mile to westward, while to the northeast, the east, and the southeast lay a nest of boiling reefs.

Contrary to our expectations of total wreck, at noon, by aid of the tide and the discharge of her ballast and oil fuel, the *Laddie* hobbled off unhurt. Our good fortune did not end here, for the watering crew, taking the ship's casks ashore to refill them, climbed a low hill of the small island's northern end and from its vantage saw land to the west extending north and south over nine points of the compass and distant approximately twenty-five miles; obviously it was an island seaboard at least sixty miles in length—identifiable only as the eastern coast line of the Belchers.

That evening we arrived at the northerly extreme of the island, logging twenty-two knots for the distance. From the crest of the shore range, a bold island-free coastline of barren, ice-scoured diabase descending some 250 feet half roundedly like a whale back into the sea, we gained a view of unbroken ranges of land to the westward, barren save for plots here and there of russet mosses, studded with tiny lakes, and extending inland to a horizon twenty miles away, and here, typifying as strikingly the topography of the country as do those of the Nastapokas and the mainland, lay the Animikies—first the coastal eruptives, and beyond them the red bands of shale and marl, the yellow of the quartzites, and the white gray of limestone, all paralleling north-northeast and south-southwest, the trend of the island generally.

A week was spent along the island's east coast. Six miles to southward of this first anchorage we entered a snug bottle-necked harbor, and, while the crew reballasted the ship and did such overhauling as under the circumstances was possible, we made crosswise trips inland and a launch cruise to the southward, covering short distances only, however, since we found the ore series we were looking for on the shores of the harbor itself, and detail work upon it consumed most of our time. We kept a sharp lookout for natives, but none were seen; though recent fire places, boulders, and old goose blinds were noted at several points along the shore.

RETURN TO GREAT WHALE RIVER POST

Embarrassed by the unseaworthy condition of the ship, on the morning of September 13 we cleared the islands, southward bound, to berth her for the winter at Moose Factory. At Great Whale River post the expedition instruments and gear were discharged and stored away against our return islandward the following open season.

Strangely enough in the interval of my last visit to Great Whale River there had been brought to the post by one of the Hudson's Bay Company's employees, as a curio from a far-out post east of southern James Bay, an

old post copy of company correspondence—letters of Sir George Simpson, governor of the company, and of his factors on the bay during the years 1846-1849. These letters contained, besides routine business matters, a project for sending to the Beleher Islands, in order to open up trade with the inhabitants there, a half-breed servant of the company, Thomas Wiegand by name, with Eskimo companions. The letters relate how Thomas Wiegand carried out this project, making two trips to the islands, as given in the following reports of his expedition.

LETTERS RELATING TO THOMAS WIEGAND'S VISIT TO THE ISLANDS IN 1847-48

Extracts from a Letter from John Spencer, Fort George, dated July 9, 1847, to Mr. Jos. Gladman (Chief Factor)

..... Conformable to your wish I sent Thomas Wiegand and those that I mentioned to accompany him to the Esquimaux Islands on the 3 March & they took their departure soon after the Ruperts Ho: men went off from here; but in consequence of the rough state of the Ice, accidents with the sled, and bad weather they were 7 days in crossing from Land to Land. Tom suffered a good deal from cold & the change in the mode of life which was natural to be expected, and the want of fresh water was a great privation to him, for the snow he was forced to make use of was completely saturated with the salt water rime which brought on severe dysentery Complaint. He saw but 5 Esqx at the Island he went to, as the rest had some time previously taken their departure to the northward with the view of hunting the Sea-horse at the Sea Horse Islands

However, the purport of this Trip was not so much for Trade as for ascertaining the lay of the Islands which Tom has now thank God so far ascertained as well as the position of an harbour for the Vessel, which is as far accomplished as a winter Survey would reasonably allow of, he has moreover given them instructions to be upon the lookout for the Sloop about a certain time of the year and Should she make her appearance for them to make a Smoke &c &c to say nothing of Land marks they are directed to set up. It must be necessarily the lapse of another twelve month before the more distant Indians [Eskimos] can receive the Glad Tidings thats in contemplation for them which no doubt they will be very happy to hear of. Altogether I should say the Trip augers [*sic*] favourably for future enterprise and time with patience are two of the Ingredients required for us to wrestle with in bringing things about as it will [be] a most desirable object to see those Islands by open water when every thing its to be hoped will appear to better advantage than when under the course of Snow & Ice

Extracts from a Letter from John Spencer, Fort George, dated Jan. 8, 1849, to Jos. Gladman, Esq.

..... At all events he [Thomas Wiegand] succeeded in accomplishing a very important object in his visit to the Esquimaux Islands having neither met with obstructions from Ice or shoals and when arrived there he met with the shelter and security of an excellent Harbor; Objects of no trifling consideration to the explorers of a strange Coast—And although it so happened that he saw but few Natives and got but little from them it would be highly ridiculous in endeavoring to make that appear as a sufficient reason for not going again, and that their poverty should for a moment be thought sufficient for framing such an Idea, an Idea in itself as absurd as it is ridiculous and could only find shelter in a narrow mind, for after our Knowledge of those Islands being more or less inhabited, and that those Natives are living under no other protective hand than that which nature bestowed upon them; indifferent should we be

considered in our endeavor towards bettering mankind were we to shew ourselves indifferent towards them; and the more so when we seriously reflect on their present condition and coupling with it the short distance at which they reside from European aid—I think the three first objects above cited are of themselves a sufficient reason as well as consideration for future enterprise even chilled as the minds of the Crew were at the solitude of the place which in itself ought to form but a secondary consideration when exploring the regions of so inhospitable a portion of the Coast—what is it to them whether the ground be covered with luxuriant verdure and every thing around cheerful and pleasing; or for them to find it as they did, provided they are blessed with a good harbor when arrived there; and by conceiving measures hereafter who Knows but the inhabitants of these Islands may be brought to furnish a valuable portion of Trade in Blubber, Foxes, Ivory and what not—All such matters have yet to be tried and if we cannot succeed it will then be time enough to relinquish the thing, and at the present moment I have no doubt but they view the Trip over there with a degree of unpleasantness altogether Ideal. For my own part I think all was done that could be reasonably expected of them, and the circumstance of the poor trade they met with I look upon as nothing just now—they succeeded in getting there and very smart too, they found a good harbor and these are grand objects; and its now for us to endeavor to do the needful in establishing among the Inhabitants of these Islands a perfect understanding of an annual visit from us for the purpose of Trade (Weather and circumstances permitting) and to endeavor to set them on a footing that will be worth while for us to go there, adding as it will to their comfort and convenience under a Hope from ourselves that such intercourse will ultimately prove beneficial to the concern

GENERAL RESULTS OF OUR THIRD EXPEDITION

That this estimable scheme for mutual benefit, however, was not to be realized is apparent from the fact that the islands so soon and so completely drop out of Hudson Bay tradition. None of the letters gave any evidence as to their size. Our own testimony to the extent of the land we had seen was received both at Great Whale River and elsewhere on the bay with open skepticism and no little “pleasantness” on the part of Company men whose life’s experience had been along the Great Whale seaboard.

We arrived at Moose Factory on October 2, and there experienced an aftermath of the island shipwreck, when the *Laddie*, discharged of her ballast and gear, filled to the engine room, but settled, fortunately, on a shallow river bar, over which she lay at anchor until berthed.

FOURTH EXPEDITION

After spending the winter in the confines of civilization we again reached our field of operations in September, 1915, when the *Laddie* again dropped anchor in the shelter of a Belcher Island sound. On this, our second visit to the islands, the explorations were carried on continuously through the winter and summer until the following September. They were as comprehensive as the limited resources of the expedition in men and means permitted, for only the ship’s master, W. Robertson, and a Moose Factory servant, to both of whom I am deeply indebted for what was accomplished, remained with me through the winter and following summer. The remainder of the crew were sent out in October and February owing to our



FIG. 7.



FIG. 8.



FIG. 9.

FIG. 7—Looking westward (8 miles) across Wetalltok Bay.

FIG. 8—Kasegaleek Lake: looking northward from 10 miles beyond its southern end. May, 1916.

FIG. 9—Kasegaleek River, the discharge of Kasegaleek Lake (at its southern end).

lack of fuel and provisions. By mid-March our fuel had become exhausted, and the *Laddie*, now crewless anyway, became the victim of circumstance and afforded us a fuel supply by her masts, yards, bowsprit, rails, and cabin—all of her in fact that was combustible. The following open season's work and the final journey from the islands were carried out in the *Nastapoka*, the same diminutive craft we had attempted to use in our first futile effort to gain the islands from Great Whale River on our second expedition.

TOPOGRAPHY AND STRUCTURE OF THE ISLANDS

The original map of the islands accompanying this article (Pl. IV) is a compilation from the maps we made as we traveled across country by sledge in winter, and along the coast by boat in summer. Though only approximate—distances were reckoned by odometer and log—it gives a fair idea of the extent of the islands and should be of use to those who may eventually chart them by detailed survey.

As the map shows, the islands cover an area of more than 5,000 square miles, having an extreme length north and south of 91 miles and an extreme width of 57 miles. The reader will note the peculiar outline of the islands, the consistent trend of sounds, indentations, bays, and inlets. The island ranges also, barren hills, the highest of them not more than 480 feet as determined by aneroid, lie like bands of rounded ribbing, paralleling the islands' trend. This is typical of the Animikean rocks, which were found everywhere to comprise the rock system. Eruptive diabases, extending over a third of the islands' surface area, include the more prominent of the ranges and are distinguishable by their conspicuous brown black appearance, by their generally more barren condition, and by their massiveness. They form a striking contrast to the sedimentaries, which lie in folds, synclines and anticlines, dipping east or west, as the case may be, at an angle which varies from 50° to 5° .

Owing to the absence not only of tree growth but also of soil, except where to a local extent it occupies the floors of valleys, the rock formations are everywhere so well exposed that with a field glass from a distance of six miles or more we were able to locate the white bands of quartzite, the reddish masses of the ore series, and the jet-black hills of the eruptives. This absence of trees and soil was a factor in facilitating exploratory work whose value can hardly be realized by one not familiar with such conditions.

THE LAKES

Throughout the interior of the larger islands lakes are everywhere found. They range in size from goose ponds and pools in the peaty tundra of the valleys to the magnificent Kasegaleek Lake (Lake of Seals). The smaller lakes are generally shallow; in many the ice freezes to the bottom, that is to a depth of six feet. The lakes not thus frozen in winter contain an abundance of Arctic salmon and whitefish, the only species of fresh-water



FIG. 10.



FIG. 11.

FIG. 10—Occurrence of iron ore and jasperite raised by frost action above ground level (indicated by the snow patches).

FIG. 11—Typical moss valley and barren diabase hill in distance.

fish found and an important source of the islanders' game supply during the open year until the middle of December. Kasegaleek Lake, 43 miles in length and, on an average, $7\frac{1}{2}$ miles in width, occupies the largest and central island of the group. It lies some 40 feet above sea level and discharges from its southwestern extremity through a small river 10 miles in length. This river is broken into a series of lake expansions and descends by rapids, none of them too rugged for kayak travel, to the sea. A mile from its mouth it is 200 feet wide, has an average depth of 4 feet, and a current flowing at the rate of 3 miles per hour. The eastern shore line of the lake is composed of almost sheer rugged cliffs and steep hills of diabase, averaging 150 feet in height and extending nearly the entire length of the lake. On the lake's northeastern portion, a U-shaped bay extends eastward to within 1,500 feet of tide water, to which, through a canal, the water of the lake could easily be led, with a fall of 40 feet.

The western shore of the lake is less rugged and is broken by islands and long-fingered indentations which run parallel to its length. The islands increase in number to southward, being most numerous in the southwestern portion. The natives say that the lake is extremely deep. Unfortunately I had neither time nor opportunity to make soundings. Innumerable pools and small lakes on the islands and throughout the low tundra of the western shore are breeding-grounds for geese during the months of May, June, and July. At this season the natives come there to hunt them, to gather eggs, and to fish for the Arctic salmon which then are spawning in the gravels along the shore line and in the mouths of entering streams. Here also they hunt the fresh-water seal, with which, they assert, the lake abounds; hence its name. Its clear, green water, hemmed in by the jet walls of rugged shore, with a traverse that extends to a landless horizon when viewed from either extreme, forms, despite the dearth of trees and vegetation, a picture that is singularly beautiful.

NAVIGATION

Good harbors, ranging from sounds to small and snug bottle-necked anchorages, occur throughout the islands. With proper charting, the approach from sea, save along the southwestern coast, should not be at all dangerous. The season of open water varies greatly, however. During the year of our residence the field ice cleared on June 10 and did not return again during the summer. We gathered that this was a very unusual occurrence and was due to the prevalence of northerly winds during May and June when the sea ice was rotting and being broken by the tides. The Eskimos say that in some years the islands have been surrounded by pack ice as late as mid-August, and that ordinarily the annual clearance occurs about the first week in July. For ships built for the navigation of Hudson Strait the average date of approach to the islands should be approximately the first week in July, if not earlier, since much of the field ice, if

still existent, would then probably be rotten enough to offer no obstacle. Obviously only ice observations covering a period of years can yield results of definite value.

CLIMATE

The climate of the islands differs widely from that of the opposite mainland. Compared with weather reports from Great Whale River for the same period, our observations gave a far greater proportion of overcast skies and fogs, stronger and more constant winds, but higher and more equable temperatures. From October till early December winds of a velocity up to 50 miles were almost constant, and the sky was continuously overcast.

No snow covered the ground permanently until November 15, and no ice was formed in the small lakes near the wintering base until December 4, when the long period of winds ceased and a fortnight of calm, clear weather set in. The mercury did not fall below zero until January 2—a weather condition without precedent in my experience of the North. Great Whale River early in December had a minimum temperature of -30° and recorded a constant average for the period well below zero.

On January 2 winter commenced in earnest. The month was characterized by constant drifting winds of a maximum force of 70 miles; calm days were unknown; and the average temperature was -16° . In February the winds abated; there were many days of sunshine, a few of them almost calm. The average temperature for the month was -19° . Throughout March strong winds again prevailed; by the end of the month the snowfall for the winter had reached its maximum, 4 feet; the average temperature for the month rose to -9° . In April and May there was the usual prevalence of wind, and several blizzards occurred, each covering a period of from one to two days. In the latter part of May the weather broke and became warm and summery; in fact, there were heavy thunderstorms at this time. On May 28 sledging over the ice fields was at an end, and by June 10 the field ice surrounding the islands had blown off to southward. Then commenced the most trying time of the year; for hardly two days together did fair weather obtain. From mid-June onward to the time of our departure on September 13 exceedingly heavy gales of wind of from one to three days duration occurred in every week. The prevailing direction of the winds was south-southwest for not only that period but for the entire year. Days of sunshine were rare; the sky was generally overcast; and rains, accompanied usually by heavy south-east winds, were frequent. According to the natives the weather we experienced during that year was not at all typical; usually, they said, the winds were fewer and less violent, and the temperature during the winter was lower. The remarkable lateness of the freeze-up (December 23) was, they said, without precedent. The minimum temperature for the winter was

—48° as compared with the lowest mean reported temperature on the mainland of —55°. The maximum thickness of fresh-water ice was 5½ feet, and of sea ice 5 feet. The maximum temperature for the summer, occurring on July 25 at noon, was 70°.

PLANT LIFE

The plant life of the islands, typically subarctic, like that of the mainland comprises the Arctic white and gray lichens and mosses, the stunted northern willow, the dwarf birch, and flowering plants. Before the snow has altogether disappeared in late June banks of anemones—solid masses of color, yellow, purple, and white—and waving plumes of wild cotton lend the moss-carpeted valleys the aspect of cultivated fields.

At least six varieties of edible berries are found; they are for the most part ripe by mid-July and occur wherever the mosses grow plentifully. All of them are much prized by the Eskimos and form the only vegetable portion of their otherwise exclusively meat diet. First in importance is the cranberry, chiefly valuable because of its keeping quality and its medicinal value as an antiscorbutic. The Eskimos, however, unlike the Indians of the Ungava interior, do not gather the berries for storage through the winter.

ANIMAL LIFE

Compared with that of the mainland, the animal life on the islands is more typically arctic. Here the black bear, beaver, otter, wolf, wolverine, marten, ermine, and fisher are unknown, and the only species common to the country along and south of the timber line are the colored foxes. The various species of seal, cited in the order of their importance from the point of view of the natives' food supply, are: the ringed seal, the square flipper, the harp (rare), and the fresh-water seal. Walrus, hunted at various points on the most northerly outliers of the islands, are found there in large herds during the open season.

Till within the last thirty-five years or so there grazed on the islands large herds of Barren Ground caribou. In one portion mounds of their bones can still be seen. The natives explain their disappearance as the result of heavy rains followed by a cold wave which froze the moss and lichen plains into a vast glaze of ice so that the caribou, their food supply rendered inaccessible, all perished from starvation. At about this same time, however, the mainland herds also disappeared, changing their migration to the eastern slope of the Ungava Peninsula, since which time they have never as a herd reappeared along the Hudson Bay slope south of 60° N. This shifting of the mainland migration is the more probable explanation of the disappearance of caribou from the islands, particularly when one considers the ease with which they could cross the field ice connecting the islands with the mainland in winter.

The white whale, or porpoise, is found in large schools during the open

season throughout the island sounds and larger indentations. Its flesh is highly prized by the natives, as is also the oil. The hide furnishes a high quality of leather.

The right, or bowhead, whale is not known, though it ranges as far south as the Ottawa Islands in 60° N., where the Scotch whaler *Active*, of Dundee, has twice wintered. We found the carcass of one, probably killed by the *Active's* crew, on a small outlier northeast of the main islands. The sight of it was a novelty to the natives who were with me at the time.

Polar bear are found most plentifully when the coast is icebound, or when large areas of field ice surround the islands. In summer they are rare. We saw none during our exploration of the country, and less than six were killed by the natives during that period.

Of the foxes—white, red, cross, silver, and black—the white, or Arctic, is more numerous than all the other species together. The blue fox is also found, but more rarely. Arctic hare are not plentiful. Of the small rodent forms the Hudson Bay lemming is the most common.

BIRD LIFE

Of the birds on the islands, which, with their eggs, constitute an important source of native food supply during the breeding months from mid-May to mid-July, sea fowl are, of course, the most abundant. They are represented principally by the eider duck, first in importance as game; the black duck; the glaucous and, more rarely, the ivory gull; the black-throated and the red-throated loon; the plover; the yellowlegs; and the sea pigeon, found in large rookeries on certain small rocks outlying from the main island group. The Canada goose breeds on the islands in large numbers, the first arrivals coming on or about the last week in April; and with the southward migrations in September and early October comes also the wavey, and sometimes the brant. Rock ptarmigan are not plentiful.

POPULATION

The Eskimos native to the islands are called Kittoktangmiuts, or "islanders," in distinction to the Itivimiut, or mainland, tribe. Of these there are not more than five families, the remainder of the population, twenty families or so, being made up of mainlanders who, attracted by the walrus grounds and sea-fowl rookeries and outlawed in some instances by their own people, have from time to time emigrated to the islands. The tribes are not radically different. The most noticeable difference between them is not so much the dialect as the manner of speaking. The islanders speak more slowly; as Harold aptly expressed it, they have "the speech of children."

Since the disappearance of the caribou from the islands the population, for want of deerskin, has had recourse for clothing in winter to the feathered

skins of eider duck and sea pigeon (Figs. 12 and 14). These materials are inferior in wearing quality, heavier, and too warm for even the coldest weather; furthermore, to the white man's nose at least, they are most obnoxious. The summer clothing, fashioned according to custom principally from sealskins, is not distinctive; nor are their implements, sledges, and kayaks different from those in use on the mainland.



FIG. 12—A Belcher Island Eskimo boy in eider duck costume. Skins reversed, feathered surface inside. The boy's left cheek is frozen.

The services of many of the people were utilized during our wintering in connection with exploration work. Their aid proved invaluable. They took a real interest in our iron ore exploration, particularly when we pointed out that their guns and knives were made from iron ore. We taught them to apply the test for hematite by scratching specimens for a characteristic red streak, and many of the ore occurrences that we explored were first found by them.

During the winter we compiled a series of motion pictures, showing the primitive life, crafts, and modes of hunting and traveling of the islanders—an improved version of the film we had previously made on the

Baffin Island expedition. With a portable projector brought for the purpose we showed the islanders a copy of the Baffin Island film, purposing in this way to inspire them with that spirit of emulation so necessary to the success of our filming. Nor were we disappointed. Enthusiastic audiences crowded the hut. Their "Ayee's" and "Ah's" at the ways of these their kindred that were strange to them were such as none of the strange and wonderful ways of the *kablunak* (white man) ever called forth. The deer especially ("Tooktoo!" they cried), mythical to all but the eldest among them, held them spellbound.

Indeed for the co-operation of the people we had reason to be grateful throughout our stay with them. To their daring as kayakers, surpassing that of any other Eskimos of my acquaintance; to their knowledge of ice fields and their "working"; and to their craft and skill at winter traveling, we in great measure owed the safety and success of various undertakings.

Their honesty was the honesty we had learned to admire in the Baffin Island Eskimos, with whom we had lived under the same conditions of

trust. For we had a trade outfit, apart from expedition supplies, which we used in paying the natives for services in film work and exploration, for dogs and dog driving, and for such game as they could furnish at various times through the year; and this material, several tons of it, consisting of flour, pork, sea biscuit, grease, sugar, tea, tobacco, cheap candy, finery, knives, axes, files, Winchester .44 carbines, powder and shot, nails, and bits of hardware—a treasure trove in the native eyes—was housed in ten-by-twenty-foot tents and, though easy of access to any who might wish to help themselves, was never once molested.

MINERALS

Our mineral explorations resulted in the discovery of four distinct ranges of iron-bearing rocks, 30 miles in length and 3 miles apart, one from another, in an east-and-west direction, on the eastern half of the islands. The longest continuous outcrop found was 4 miles in length, with an average width of the ore body—if such it may be called, for it is a mixture of ore, jasper, and much other siliceous material—of 30 feet. This outcrop is the northern extremity of a range which follows for 25 miles the eastern shore line of Keepaloo Inlet. Here from what is the western edge of an enormous syncline the ore series dip 40° to eastward and underlie Omarolluk Sound, $5\frac{1}{2}$ miles across to its eastern shore, where the eastern edge of the fold is found, though in much leaner state and less exposed at surface. These figures may convey to the reader some idea of the magnitude of the largest of the iron ore deposits. No ore of high quality, however, was found. The best, in Keepaloo Inlet, averaged from wall to wall not more than 38 per cent metallic content—obviously too low-grade a product for present operation in these latitudes. The principal detriment to the ore is silica; as far as phosphorus is concerned it is fairly clean, averaging less than .005 per cent.

In certain contacts between the silicified limestones and diabase on the western slope of Tookearak Island were found occurrences in small stringers of calcite, of smaltite, and of cobalt bloom. There was no body of calcite, and the distribution of the minerals where found was sparse. Other minerals noted were manganese, occurring in small stringers in iron-bearing



FIG. 13—A Belcher Island Eskimo woman, aged about fifty years.

ing slates and chalcopyrites, some of the latter mineral containing as much as 30 per cent of copper. Neither mineral was found in commercial quantity, however.

OTHER EXPEDITIONS

In August, 1916, the writer's father, R. H. Flaherty, M.E., Dr. E. S. Moore, professor of geology in the Pennsylvania State College, and W. H.



FIG. 14—A Belcher Island Eskimo in eider duck costume. Feathers outside.

Howard, Dominion Land Surveyor, arrived on the islands. Dr. Moore and Mr. Flaherty made geological and mining reports on the expedition discoveries. Dr. Moore also made a geological cross section of the folds of rock series over the eastern half of the islands. Mr. Howard's work comprised an accurate determination of the position of the islands in relation to known points on the mainland as well as some detail surveys in connection with Dr. Moore's and Mr. Flaherty's reports to Sir William.

During the summer of 1915, that is the summer succeeding our first landing on the islands, the Hudson's Bay Company had made an expedition

there with a local James Bay steamer and salvaged one of their sailing vessels which had been carried away by ice the preceding fall from Fort Churchill 500 miles across the bay. She had been reported to Mr. Mavor, the factor at Great Whale River, by migrating Eskimos, whereupon he had sent out his clerk, Mr. E. Renouf, a young Englishman, to verify the report. This Mr. Renouf did, crossing the field ice with two Eskimos, the first crossing over the ice to be made by a white man since Wiegand's in 1849. During our wintering Mr. Mavor and the Rev. Mr. Walton, missionary to the Eskimos of the Great Whale seaboard, visited me. All of this was the more interesting since the bay folk had been skeptical of Wetalltok's "Big Islands" yarn. The Big Islands are ancient history in the bay now, and Wetalltok stands vindicated.

THE GUATEMALA EARTHQUAKE OF DECEMBER, 1917, AND JANUARY, 1918

In December, 1917, and January, 1918, the city of Guatemala was practically destroyed by earthquakes. The following is the account of a prominent resident of that city, as given to Professor Marshall H. Saville of the Museum of the American Indian, Heye Foundation, New York. At the end Professor Saville continues the narrative and has added a few words of comment. For further information on Guatemalan earthquakes and their relation to the seismic activity of Central America see the works cited below.¹

Two years ago, during the months of December and January, the city of Guatemala had been shaken by a series of severe earthquakes, lasting seven or eight weeks, and people by the thousands spent the nights in their courtyards or in the public parks and squares. These shocks, however, passed off without doing any considerable damage to the city, and this confirmed the Guatemalans in an ancient belief that their city, being almost entirely surrounded by deep ravines, was effectually protected against destructive earthquakes. A hundred and forty-five years ago the location of the city was carefully selected under the influence of this theory, and during all these years it had never been seriously damaged, while many other large cities in all parts of Central America were destroyed one after another. This unfortunate theory was also the reason why no thought whatever was given to earthquakes in our system of building. Only recently have a few concrete buildings and a few frame houses been erected by far-

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- ¹ S. G. Morley: The Guatemala Earthquake [of 1917-18], *Amer. Museum Journ.*, Vol. 18, 1918, pp. 200-210.
 ———: The Guatemala Earthquake [of 1917-18], *Pan-American Mag.*, Vol. 26, 1917-18, pp. 305-317.
 (Crichton Mitchell): Seismic Disturbances Connected With the Guatemala Earthquake, *Nature*, Feb. 28, 1918, pp. 514-515.
 Tempest Anderson: The Volcanoes of Guatemala, *Geogr. Journ.*, Vol. 31, 1908, pp. 473-489, with map, 1:500,000.
 Gustav Eisen: The Earthquake and Volcanic Eruption in Guatemala in 1902, *Bull. Amer. Geogr. Soc.*, Vol. 35, 1903, pp. 325-352.
 F. de Montessus de Ballore: Temblores y erupciones volcánicas en Centro-América, 246 pp., San Salvador, 1884 (French version, Dijon, 1888).
 Idem: Les tremblements de terre: Géographie séismologique, Paris, 1906, Chapter 21, Section 2: Le Centre-Amérique.
 Karl Sapper: Die mittelamerikanischen Vulkane, 173 pp., *Ergänzungsheft zu Petermanns Mitt.* No. 178, Gotha, 1913.
 Idem: Die geographische Bedeutung der mittelamerikanischen Vulkane, *Zeitschr. Gesell. für Erdkunde zu Berlin*, 1902, pp. 512-536.
 Idem: In den Vulcangebieten Mittelamerikas und Westindiens, 334 pp., Nägele, Stuttgart, 1905.
 Idem: Ergebnisse seiner Reisen in Mittelamerika, *Verhandl. Gesell. für Erdkunde zu Berlin*, Vol. 27, 1900, pp. 417-426, with map of tectonic lines of Central America, 1:5,000,000.
 Idem: Grundzüge des Gebirgsbaus von Mittelamerika, *Rept. 8th Internat. Geogr. Congr. Held in the U. S. 1904*, Washington, 1905, pp. 230-238, with map of tectonic lines of Central America, 1:5,000,000.



FIG. 1.



FIG. 2.

FIG. 1—Ruins of the church on the Cerro del Carmen, the oldest church in the city.
 FIG. 2—Ruins of the church of Santa Teresa.



FIG. 3.



FIG. 4.

FIG. 3—Ruins of the Military Academy.

FIG. 4—Interior of a ruined church.

seeing persons. The rest of the city is built on shallow foundations, with weak walls of red brick or sun-dried mud, and heavy tile roofs, whose unsightliness was hidden by exceedingly heavy over-roof walls and cornices. So when a real earthquake caught us we were in no condition to resist it, and our childish theory was thrown to the ground together with our houses.

The present series of earthquakes began on November 17, 1917, with great severity, and kept on for three weeks, making small cracks in many walls and knocking down some top-heavy cornices. Then there was a lull till Christmas Eve. On that evening there was a severe shock, followed by several minor ones, all, however, of the kind to which we had been accustomed for generations. The great and unprecedented disaster was reserved for Christmas Day.

THE CHRISTMAS SHOCK

At about 10.35 on Christmas night the town was aroused by a shock such as had never struck it before. The earth rocked like the sea for about a minute. The falling of furniture, the crackling of ceilings and roofs, and the swaying of walls were stupefying. Everyone immediately sought shelter in the streets though the cold was piercing. The electric lights were soon extinguished, but in the clear light of the full moon one could see the walls cracking and toppling, and the tiles thrown about in confusion on the roofs. The crowds stood about in their night clothes looking on in terror and helpless despair at the ruin of their homes and recounting their experiences. The earth trembled every few minutes, though less violently for a time; but about half an hour after the first great shock there followed another of equal duration and even greater violence. Houses swayed to and fro before our eyes, till the walls that had been cracked or shaken out of plumb came down with a crash, followed by ceilings and roofs. For a few brief seconds the rumbling of falling houses was mingled with the underground roarings of the earth and the suppressed moans and loud prayers of the women for mercy. Then all was still once more. The angel of destruction passed on, for his work was done, completely and thoroughly done, and in his wake lay the scattered ruins of the proud "City of Santiago of the Cavaliers of Guatemala." But the earth had not yet righted itself, and the trembling kept up with slight interruptions till daybreak. The crowds either stood all night stupefied before their houses or moved down the middle of the streets towards the open squares to await in terror what might still be in store for them. When the dawn came the whole awful scene of destruction was laid bare.

The high massive façade of Saint Francis Church was rent in every direction, and great blocks of masonry lay scattered about. The roof of Saint Claire's Church had fallen in from altar to portal and burst open the heavy door. The tall fluted cupola of the Church of the Recollection, a marvel of grace and beauty, had fallen into the nave. The great yellow

glazed cupola of the Cathedral fell at the second shock with a terrific noise. Towers, belfries, and façades of churches in all parts of the city were either thrown down or split wide open, and left standing at all angles on the thick lower walls. The post office was smashed to pieces, and its wreckage filled the street. One entire wall of the railroad station had fallen out, and the clock tower was knocked down. The British Legation and the Custom-house were heaps of ruins. As for the dwelling houses, on all sides their outer walls were thrown down into the street, their roofs fallen in on gaping bedrooms and sitting rooms, their rafters and tiles piled on top of beds and tables, while smashed clocks, mirrors, and pictures littered the ground or hung awry upon the walls.

On December 26, when the violence of the tremblings had partly subsided, people began to creep back into their homes to rescue some of their belongings, principally bedding and clothing. It was then found that many houses which seemed uninjured from the outside were dangerously cracked within, and most of those left standing were so badly damaged that they would have to be torn down.

But we were to be spared that trouble; for slight shocks kept up during the whole of the 26th, and at two o'clock in the morning of the 27th a third powerful shock aroused the slumbering people, and many more houses were heard to fall. Also at intervals many walls that were out of plumb fell over of their own weight.

THE SHOCK OF DECEMBER 28

On the 28th at half-past two in the afternoon a long and terrible shock overtook us. This was the first mighty and destructive shock that happened during daylight, and many women fainted with terror. It was on this occasion that Dr. Manuel Del Valle, riding out on a Red Cross errand, was caught by a falling house and crushed to death together with his horse.

Then followed a period of comparative respite, and people began to collect their senses. They soon got out their beds into the streets, set up their tables and bureaus around them, and covered the whole with carpets or any kind of cloth to shelter themselves during the night. They began putting up shacks of every nondescript shape in the parks and open squares. Probably there were not a dozen families that still dared to live in their shattered houses. In every public square and on the plains around the town sprang up villages of gypsy-like huts. They were crowded together; built of carts and carriages, pieces of furniture, and broken doors and windows; and covered with galvanized iron, helped out with blankets, flags, tablecloths, carpets, and sacking. While food at first was not exactly abundant, there was no famine or even actual want. The government saw to it that the people were well supplied with meat at low prices. Meat, maize cakes, and coffee were our principal diet in these days; and as soon

as the bakers could get to work again bread made its appearance, though it was bad and dear. New Year's Day came and went, and nobody thought of wishing his neighbor a Happy New Year except with a sarcastic laugh.

THE SHOCK OF JANUARY 3

During all these days the earthquakes never ceased. At intervals of an hour or so they reminded us that all was not yet well; but, as our lives now



FIG. 5—Ruined freight cars in front of customs house sheds. Of the original sheds only the walls are standing; the roof and sides were put up after the earthquake.

seemed safe and our property was already destroyed, we had become quite indifferent and hardly did more than look around us at each new tremor. But we were soon awakened from our indifference. On the night of January 3 came the terror of terrors, the most pitiless and awful blow that had yet struck this poor shattered city. At a quarter to eleven there was a loud subterranean growl, and the earth seemed to have been struck a great blow that sent it up, and then let it fall down with a thud, and then sent it swinging and shivering in swift jerks which kept on and on and would not stop, while the underground roarings continued till one's mind was so stunned and confused that it seemed as if the world were crumbling to pieces. This must have lasted a minute and a half.² No one now looked up to say unconcernedly "There's another" or to make flippant remarks. The helpless sufferers sat up on the ground where they had been sleeping firmly propping themselves with their arms for support, and no words but "Oh, Oh, Oh" were anywhere heard. When the shock had passed away everyone felt like crying aloud at the cruelty and brutality of it all, but while it lasted one's only feeling was of groveling terror.

² According to a credible informant the shock lasted eleven minutes!

THE DESTRUCTION WROUGHT

In the morning it was seen that the two massive towers of the Cathedral had been thrown down, one to the north on the Archbishop's residence, and the other to the south on top of the bishop's school. This seems to show that the oscillation was north and south. The beautiful Church of the Recollection was leveled to the ground, not a stone left upon stone. Even thick brick walls of the penitentiary were laid low; the fortress of



FIG. 6—The plaza in front of the Cathedral showing shacks, some of them housing government departments, erected after the earthquake.

San José, overlooking and dominating the city, could hardly be made out, for it was flat with the ground. The railroad station had been tumbled into one huge heap of wreckage. The entrance into the city for those who came by train will never fade from their minds. After leaving the train and the ruins of the station, one emerged upon a street buried with débris of fallen houses lying deep in dust, and up and down the street as far as eye could reach not a house was left standing. The center of the town suffered least. There, some ancient, low, and very solid brick houses were apparently uninjured; but probably not five out of a hundred houses in the city can be repaired and made habitable again.

RELIEF MEASURES

No official figures of the loss of life have been issued; but it is believed that less than fifty persons perished.³ The first severe shock gave sufficient time to escape from the houses, and after that everyone camped out in the open; but some who ventured back into their houses to get out bedding and

³ A later and what is believed to be more accurate estimate places the total number of dead as the result of the various shocks at six hundred.—M. H. S.

other effects were caught and killed in the second shock of Christmas night.

The distress has been much relieved by emigration to the country. Nearly all the planters and all others who have country places have sent away their families, and hundreds of these kindhearted people have sent out invitations indiscriminately to their city acquaintances to come out and join them in the country.

The six city banks and the United Fruit Company have built wooden offices in the main square. All bank credits have been suspended, and the banks have limited payments to each depositor to \$25 a week. These measures have greatly increased the distress, for now no one has the wherewithal to pay his servants or employees.⁴ The bank safes are supposed to be empty, for the banks have loaned out not only the paper bills they were authorized to issue, but almost all of their deposits. They have now asked the government for authority to issue the equivalent of two million dollars American gold in Guatemalan paper, so as to pay depositors and resume credits.

THE PROBLEM OF REBUILDING THE CITY

And now the problem that confronts us is the clearing away of the old town and the building of the new. This is such a large and many-sided question and has been thrust upon us so suddenly that no one is ready with a complete answer. In the first place where shall we get the means to rebuild? When San Francisco was burned down, she turned to the fire insurance companies for relief; but there is no insurance against earthquakes. At present our only hope is in the banks; but it is clear that they would have to loan almost the full value of the house in order to rebuild it, and would any bank be willing to do this?

Then again our whole system of building must be altered. It would be the height of folly to rebuild the city of brick and adobe in this land of earthquakes. On this all are agreed. With the introduction of frame buildings, which have shown themselves to be earthquake-proof, the streets should be widened, the houses built farther apart, a reformed and modern water system put in, and efficient fire protection established. Until we are prepared to do all this the reconstruction of the city should not be begun. Halfway measures would be unavailing and dangerous.

Fortunately for Guatemala the source of her wealth is not in the city. The city has never produced anything worth mentioning and has never been more than a trading place for the middleman and speculator and a lounging place for the idle and ignorant rich. The country's wealth lies in her ever-green pastures with their tens of thousands of head of cattle; in her magnificent plantations of coffee and sugar; her fertile fields of grain; her orchards of tropical fruit; and her great forests of cedar, mahogany,

⁴ This condition was modified later, and banks allowed depositors to withdraw any sums required.

and other precious timber. All this beautiful and bountiful inheritance is left to her still—and from it must come in the end the means to reconstruct a capital worthy of this wonderful land.

Here we sit beside our little shacks in the starlight with high hopes and great ambition, dreaming of our departed splendor and how to restore it. We intend to restore it, though it may take Guatemala City a generation of patient industry and economy to regain her past glory. Even then all about the newly risen town there will always stand the massive ruins of the great churches, like giants among pygmies, to remind our sons of the terrible Christmas night of 1917.

From here on the narrative is continued by Professor Saville.

THE SHOCK OF JANUARY 24

The sixth great shock came with the full moon on the evening of January 24. The writer was traveling from Quirigua to Guatemala by train, which had been delayed near Agua Caliente by a slight slide in one of the numerous cuts. Hence the train which should have arrived in the city at 6.30 P.M. was more than one hour behind time. At 7.25 precisely, when we were about five miles out and were just emerging from a deep cut, a stone about the size of a baseball came rolling down the side and struck the sill of the window by which I was seated. The next instant a deep roaring was heard, accompanied by a terrific jolt against the south side of the train. This was immediately followed by a lifting shock on the other side. The train was going slowly, perhaps four miles an hour, and the engineer brought it to a stop within twenty feet. My first impression, due to the stone which had fallen, was that the side of the cut had caved in and that enormous stones had been thrown under and against the train. When we found, however, that the train had not been struck, we at once understood what had happened. Soon we began to feel tremors and quiverings of the earth, and from this time until 4.30 A.M. the earth was never quiet. From time to time we experienced sharp shocks, and were afterward told that forty-three distinct earthquakes had taken place. The train proceeded about a mile farther, stopping three times to have small slides in the cuts cleaned out before going through. We came finally to the last and deepest cut about four miles outside the city. This we found to be choked up for some distance; it was not cleared for a week, as the walls had been so shaken that as fast as it was cleared it again filled up. We spent the night on the train, and walked into town the next morning. In many places the road was partially blocked by débris which had fallen along the sides, especially where the road descended into the *barranca* just before entering the city. In the four miles of road I counted two hundred cracks running approximately from south to north, although there were a

few running at right angles. This direction of the cracks may be significant, as they proceed from the general direction of the quiescent volcano Pacaya. That the movement comes from this region, and not from north to south, was clearly demonstrated by one crack which I observed in the middle of the road with four branches radiating towards the north for a short distance.

Many persons affirm that this shock or series of shocks was the worst shaking which the city experienced. Others award the palm to the shock of January 3. At this time all sorts of movements were noted. One of the railroad officials was at his desk and in reaching for the lamp noticed that his flat-bottomed inkstand had jumped into the air and turned completely over, coming to rest bottom side up. As the city had been almost entirely demolished by the previous quakes, no additional damage was done by this one. On the contrary the people were rather aided in their work by the falling of half-ruined walls and the general settling of partly ruined buildings.

Up to the time of my departure from the country, about February 20, slight shocks were of daily occurrence. As the first and sixth great shakes had come with the full of the moon, people were apprehensive about what would happen when the full moon again came round. Cable reports of February 26 state that telegraphic communication was interrupted at this time by earthquake shocks of an extremely violent character.

PRESENT CONDITIONS AND NEEDS

Before this great calamity the city of Guatemala boasted a population of about 125,000. In February it was estimated that about 40,000 people had left the city. Some were slowly drifting back; but at that time people were still dazed, and the serious work of cleaning up had hardly begun. It is clearly evident that the inhabitants of this once beautiful city can never hope to rebuild it along the lines of the old city. Either concrete structures must be erected, which seems out of the question because of the great expense involved, or a city of wooden houses with corrugated iron roofs must spring up. This latter plan seems to be the most feasible one. With a single exception⁵ every house not only in the city but for a radius of perhaps twenty miles was damaged. In the city itself perhaps twenty houses may be repaired. The débris of the rest must be removed and dumped into the *barrancas*, the great ravines which encircle the town. This in itself is something of a task, as it is estimated that more than two million cubic yards of stone and earth must be run out by portable rail roads. Such a work cannot be accomplished in less time than eight or ten months. Meanwhile the people are living in shacks in the public parks and the plains outside of the city. The United States Government

⁵ The exception noted is a house of reinforced concrete which was in process of construction and was absolutely undamaged.

after the first news of the disaster sent 4,000 tents, which have been put up in various parts of the suburbs, and the Red Cross is doing valiant work. The rainy season is at hand, and pestilence will surely break out with the coming of the long period of rains. The work of removing the débris will then be much retarded, as, instead of loose earth, mud will have to be transported. Altogether in this unfortunate place conditions exist akin to those in the devastated portions of France; but in Guatemala nature, not man, is responsible, and while there must soon be an end to man's destructive energy no one can foretell when the earth in this volcanic country will finally cease its shaking.

The Guatemalans look to us for assistance. The rebuilding of this city must be financed from the United States. Already the work of the Red Cross is fast drawing this people closer to us in the bonds of good fellowship, and we have now an opportunity to cement this union into a lasting friendship.

THE ZONES OF CIVILIZATION OF THE BALKAN PENINSULA

By JOVAN CVIJIC

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[With separate map, Pl. V, facing p. 480.]

No historical phenomenon in the Balkan Peninsula exhibits so complete an adaptation to geographical conditions as does the distribution of its ancient civilizations. After a period of advance or recession, caused by exceptional historical happenings, sometimes not connected with geographical conditions, the expansion of a civilization has generally been arrested by geographical barriers. Even the civilizations which have spread over nearly the whole peninsula have finally seen their zones of influence diminish in this way. An adjustment has taken place, a perfect adaptation to geographical conditions. Thus the different zones of civilization have developed in close connection with the principal geographical characteristics, particularly those which may be termed the characteristics of union and of penetration. To be sure one occasionally finds several civilizations superimposed one upon another like geological formations. More frequently one finds them dove-tailed, as it were. Nevertheless, one can distinguish regions where a particular civilization has left a deeper impress than others. Even the civilizations which have recently entered the peninsula already show this adjustment to the geographical aspects of union and of penetration and are almost limited to definite regions.

EFFECTS OF EARLY CIVILIZATIONS—GREEK, ROMAN, CELTIC

Not every civilization which developed in or was imported into the peninsula has had the same effect on the Balkan population. The civilizations existing prior to the establishment of the Yugo-Slavs (South Slavs) and the Turks have had no influence on the bulk of the present population. Hellenic civilization was preserved neither by the Greeks nor by the remnants of the ancient populations of Illyria and Thraee, the Albanians and the Arumani of today. Roman civilization left numerous traces in a large part of the peninsula, particularly on the Adriatic coast. Here it furnished the basis on which a later civilization developed, namely the Mediterranean-Italian civilization. Latin strongly influenced the language of the Albanians and the Arumani, and Roman blood, it seems, mixed with that of the ancient Balkan population. The civilization of the Celts, who entered the peninsula from the north and spread almost as far as the Aegean region, has left no perceptible trace in the Balkan population.

The lack of continuity of the civilizational influences is a characteristic of the Balkan Peninsula, a condition the reverse of that which obtained in Western and Central Europe.

BYZANTINE AND VENETIAN INFLUENCES

Even the civilizational influences of the period subsequent to the establishment of the Yugo-Slavs, namely, those of Byzantium, which affected all of the present Balkan peoples, were often strongly modified and in some regions even obliterated by the invasion of the Turks. Venetian civilization, modified to a certain extent by the earlier infusions of Roman and Byzantine civilization, and particularly by national spirit, has been preserved only on the Adriatic littoral. In addition, considerable Turkish and Oriental influences are to be met with in the Balkan Peninsula; likewise the influences of modern European civilization. Finally, a large part of the peninsula belongs to the Yugo-Slav patriarchal régime.

The area of distribution of these civilizations, particularly the Byzantine and Venetian, whose extension had almost become stable before the Turkish invasion, was considerably modified by the great migrations of the Balkan peoples in the Turkish period. This disturbance was due to the migrations of the Dinaric peoples to Dalmatia and of the Balkan peoples to the Yugo-Slav regions of Austria-Hungary. Not only the racial groups but also the civilization of the peninsula itself thus expanded toward the north, beyond the Save and the Danube as well as in Dalmatia.

IMPORTANCE OF THE DISTRIBUTION OF CIVILIZATIONS

The distribution of these various civilizations has in itself become a very important factor in the conditions of life and in the mental traits of the population. Not alone the extent of geographical influences on man and the relations of ethnic groups must be examined, but also the distribution of the different civilizations, as this is a factor which was in the past and remains in our day of great influence on all the ethnographical and anthropogeographical phenomena of the peninsula.

We shall indicate in this paper the distribution areas of the different civilizations. We shall characterize only those which concern the peninsula or have been modified by special Balkan circumstances.

Zone of the Old Balkan, or Modified Byzantine, Civilization

The evidences of Byzantine civilization to be observed today in the Balkan Peninsula only very rarely represent its best fruits. In the first place, the literary and intellectual side is missing, likewise the material acquisitions and the ease of life of the upper classes of Byzantine society. Only the remains of the civilization of the middle and lower classes are to be found, and even they only appear in a changed, almost

corrupted form. Although Byzantine civilization had already in the Middle Ages assimilated elements from Oriental civilization, it became still more deeply infused with these elements during the Turkish period. It was also subjected to Levantine influences. Thus modified, Byzantine civilization spread during the Byzantine and Turkish periods over the larger part of the peninsula, and even in regions which are today outside its confines. Byzantine civilization has thus become Balkan civilization *par excellence*, Balkanism in the true sense of the word.

BALKANISM

Balkanism is thus not of the Orient, nor can it be identified with the Near East, as has often been done. This confusion is due to the impression created by Mohammedanism, by the Balkan Turks, by the relations which the southern regions maintained during the course of centuries with western Asia and northern Africa. Turco-Oriental influences have certainly left numerous traces in the peninsula. They have even modified Old Balkan civilization. But what is striking in the material civilization and the moral conceptions of Balkanism is notably the influence of ancient Byzantine civilization, which makes itself felt throughout the whole range of ideas, from the kitchen to the most subtle moral conceptions.

THE SPREAD OF BYZANTINE CIVILIZATION

The Greeks, the "Romans" of the Middle Ages, were and have remained the real representatives of Old Balkan civilization. Next in order come the Arumani, or Kutzo-Vlaks, who were Byzantinized. The Turkish upper classes also adopted Byzantine civilization, although Mohammedanism, as a consequence of the rules of conduct of the Koran and the closed domestic life it prescribes, hindered its infiltration. The Balkan Yugo-Slavs began to adopt it during the course of their settlement in the provinces of the Byzantine Empire and particularly after their conversion to Christianity. Byzantine civilization continued to spread in the Serbian and Bulgarian states of the Middle Ages. Historians and archeologists have positively identified the influences, often preponderant, of this civilization in the architecture, the administration, the religious organization, as well as the law, the literature, and the material and intellectual life of the Serbian and Bulgarian states of the Middle Ages. However, the Bulgarian state was more completely exposed to these influences than the Serbian state, which adopted Western influences also and the development of which, besides, shows signs of its original evolution.

INFLUENCE OF TURKISH RULE AND THE GREEK CHURCH

During the period of Turkish rule the material civilization and the moral conceptions that emanated from Byzantium, or Stambul, in particular those of the Byzantine period of decadence, continued to spread throughout

almost the entire peninsula. The ancient frontiers which hindered the advance of Byzantine civilization had disappeared, and the means of transmission remained as effective if not more so. The Byzantine, or Greek, Church, as well as the Turkish state, flooded nearly the whole peninsula with a numerous clergy and communities which multiplied. The Greeks and the Greeized Arumani became the earliest traders of the peninsula, particularly in the central regions. They were the artisans known for their Old Balkan and Byzantine trades. They furnished the *handji*, the inn-keepers, and the *bakals*, the grocers, in all the cities and even the villages along the main routes. With the Serbian emigrants they went beyond the Danube and the Save and spread throughout the cities and larger villages of Syrmia, the Banat, the Batchka, etc., where every *handji* and *bakal* called himself a "Greek" and still does to this day even when not Greek in nationality. Byzantine civilization was pre-eminently the civilization of the cities and of the main longitudinal routes Constantinople-Belgrade and Saloniki-Belgrade. The Turkish régime protected it. It is asserted that it has been disappearing rapidly with the progressive liberation of the various sections of the peninsula from Ottoman domination.

PRESENT DISTRIBUTION OF OLD BALKAN CIVILIZATION

The present distribution of Old Balkan civilization is about as follows. Its influence is strongest south of the Balkan Range and the Shar Planina, particularly in Thrace, in Macedonia, and in Greece, less in Epirus and southern Albania. Although its northern limit is generally the Balkan Range and the Shar Planina, it has penetrated by the valley of the Morava to Nish and beyond to the Save and the Danube. We have seen above that it has even crossed these rivers and spread as far as Budapest and Vienna. But this offshoot north of Nish, forming a narrow band in the valley of the Morava and beyond, has almost completely disappeared in the last decades. Traces of Old Balkan civilization are better preserved on the coast of the Black Sea. Its survivals are more frequent in Bulgaria, even north of the Balkan Range, than in Serbia.

Byzantine civilization did not spread uninterruptedly throughout the southern parts of the peninsula. Here numerous "islands," or enclaves, of the patriarchal régime are to be met with in all the areas lying outside of the longitudinal depressions. The best conserved are in western Macedonia (in the Prespa, Morihovo, Poretch, Kitchievo, Dibra, and Radika districts). Some also occur in eastern Macedonia (in the Ossogov massif, and the Malesh and Piyanetz districts). Another has been preserved in the basin of the Maritza (Sryedna Gora), south of the Balkan Range. Finally, there are traces left in west-central Greece, in the interior of the Peloponnesus, and on the island of Crete. However, the patriarchal régime differs noticeably here from that which exists in the Dinaric region, inasmuch as it has to a certain extent been influenced by Old Balkan civilization.

RURAL TURKISH GROUPS IN BULGARIA, THRACE, AND MACEDONIA

The large rural groups of Turkish population in eastern Bulgaria and in Thrace, on the left bank of the Vardar, and between Kailar and Ostrovo in Macedonia, have hardly been affected by Byzantine influences. The mixture of Balkan civilization and the patriarchal régime, of Mediterranean and Levantine influences along the Aegean coast, and of Turkish influences, makes of Macedonia a checkerboard, as it were. The limits of the different civilizations are all the more striking when they coincide with the limits of the nationalities. Nowhere does the contrast appear more clearly defined than in going from the basin of Kortcha into that of Prespa.¹

The impress of Old Balkan civilization is still very noticeable in anthropogeographical phenomena and ethnographic characteristics. It is the opposite of the patriarchal régime in a material as well as a spiritual sense. Many stresses and internal quarrels have been caused by these differences; by them the historical antagonisms of the Balkan peoples have at times been sharpened.

THE CITY DWELLERS

Urban agglomerations are in general more numerous and larger in the zone of Byzantine civilization than in the northern regions of the peninsula. Their appearance, the type of their *karshiya*, their markets, even the style of the houses is different. Certain ancient trades are characteristic, namely those which have to do with the transportation of agricultural and animal products and merchandise by means of horse caravans, a medieval form of transportation which has been preserved to our day. Another characteristic industry is the making of women's garments, often encrusted with silver and gold like an icon. The city garments of the women often have Greek names and in form are in the main of Byzantine origin. The greater part of the widespread trade in filigree objects is of Byzantine origin. The cuisine is also original in character, in the matter of dishes and the methods of preparing and serving them. Even the names of the dishes are Greek or Aruman. Old Balkan civilization smacks of an easy and regulated life, and it is patent that this quality has been imparted to the Slav population by the Greeks and Arumani. All these Byzantine traditions and survivals are permeated with Oriental elements, and it is impossible today, without special investigation, to distinguish between those which were introduced before the Turkish invasion and those which were brought in later.

The spirit of the city dwellers and even of the rural population, the ideas as to the manner of gaining a livelihood, and the moral conceptions were formed and are still here and there dominated by the Grecized Arumani and the Greeks. The manner of life of the city dwellers and their

¹ J. Cvijić: The Anthropogeographic Problems of the Balkan Peninsula, Vol. 1 of "The Population of the Serbian Lands" constituting Vol. 4 of *Srpski Etnografski Zbornik*, Academy of Sciences, Belgrade, 1902; reference on p. xxvii. [In Serbian.]

savoir vivre are regulated by certain fixed standards, by certain maxims which often recall an ancient didactic literature. The guilds, or closed trade unions, the *esnai*, the associations within which all eventualities are regulated and foreseen, attest their ancient origin. All, Slavs as well as Arumani and Greeks, are distinguished by particular bigotry. The walls of their houses are covered with pious inscriptions, but that does not prevent them from exploiting their neighbors and even making money by unfair methods. The sense of duty, responsibility, and mutual consideration is generally poorly developed. The main motive is a desire for gain, and all means which lead to it are justified. From this an extreme individualism results which makes co-operative action almost impossible.

CHURCH AND STATE

As in Byzantium the empire rested less on nationality than on religion, so, in the zone of Byzantine civilization, the Greek-Orthodox faith was for a long time superior to nationality and the peoples had almost entirely lost national feeling. Besides, the Orthodox faith here has a very particular spirit. It is curious that not only the city dwellers but even the peasants have a liking for ecclesiastical quarrels—an inclination thoroughly Byzantine. Opposed camps who held different views on material and spiritual questions concerning the Church were always numerous and gave themselves up to vehement quarrels. The religious conflict between the Slavs and Greeks about the middle of the nineteenth century appears to have found a very favorable field in this inclination.

Turco-Oriental Influences

Turco-Oriental influences are numerous and widespread. As a result of the Eurasian characteristics of the southeastern part of the Balkan Peninsula, they penetrated there before the Turkish invasion, particularly through the intermediary of Byzantium. Are not the Greeks installed on the Cyclades and on the coasts of Asia Minor a people belonging to Western Asia almost as much as to the Balkan Peninsula? A seafaring people, have they not throughout the centuries remained in close relations with Asia and Northern Africa? Numerous products and material objects have been borrowed from these regions and spread throughout the Balkan Peninsula since remotest times, mainly the various kinds of wheat, fruit trees, flowers, etc. Byzantine civilization was itself permeated with Oriental elements, which were in turn transmitted to all the Balkan peoples. Oriental influences are quite evident in the Serbian, Bulgarian, and Greek literatures of the Middle Ages and in Serbian art of the same period. Very old Oriental motifs are to be met with in the folklore and especially the folk songs and ornaments of the Balkan peoples.

EFFECTS OF TURKISH RULE

But the Turco-Oriental influences spread in the peninsula mainly during the Turkish period. They are naturally strongest among the Turkish populations, which settled in the southeastern and central parts of the peninsula, and among the Moslemized inhabitants and the Albanians, who are in the main a Mohammedan people. There are numerous Moslemized Serbians, particularly in Bosnia and Herzegovina, likewise Moslemized Bulgarians (Pomaks) in the Rhodope Mountains. These Moslemized inhabitants have contributed in large measure to the spread of Turco-Oriental influences, not only by adopting them themselves but also by spreading them among the Christian populations of their own language. Turco-Oriental influences have, indeed, in the course of the long Turkish domination, become rooted among all the Balkan peoples and, as a consequence of the metanastasic² migrations, also in the Yugo-Slav regions of Austria-Hungary, even in those that were not subjected to Turkish domination. They can be traced in the style of harness and weapons as well as in the type of cities and houses; in the prevalent indolence and laziness, the Oriental *yavashluk*, as well as in the squatting posture in which many tasks are performed; furthermore, in the Oriental prejudices, in the kindness and honesty of the Turk as well as in his fits of brutality, a trait characteristic of certain peoples of Western Asia.

"RAYA" AND "BULGARIAN"

The century-long domination of the Turks has had another effect. It has impressed upon the Balkan peoples more or less the traits of the *raya*, the characteristics of an oppressed class.

Like Byzantine civilization, Turco-Oriental influences predominate in the southeastern part of the peninsula, that is in the region with Eurasian characteristics. They have also taken deep root along the longitudinal routes of the Maritza-Morava and the Vardar-Morava valleys as far as Nish, that is to say precisely in the region where the Yugo-Slav population shows the *raya* characteristics most clearly. This fact, as pointed out in the writer's previous article in the *May Review*, has been the cause of an important ethnographical error concerning the meaning of the term "Bulgarian." This term became synonymous with *raya* and was applied to the whole oppressed population, even to the Serbian population of the southern regions. To the north of Nish and in the Dinaric regions Turco-Oriental influences are less evident, excepting in the Moslemized districts of Bosnia. They are insignificant among the ancient Yugo-Slav population of Austria-Hungary, but much more noticeable among the Dinaric immigrants in these regions. The Slav populations which are least affected by these Turco-Oriental influences are the Slovenes and the Croats of "Civil Croatia" (districts of Zagreb, Varazhdin, and Krizhevatz).

² For an explanation of this term see footnote 2 in the author's previous article in the *May Review*, p. 346.—EDIT. NOTE.

Zone of Western Civilization

Of great interest are the various contacts between the West and the Balkan world. We have already referred to the traces of Roman civilization in the peninsula. The Balkan world has also been in contact with the West at the time of the Crusades, at the time of the rule of the House of Anjou in Albania and of the Franks and the Latins on the Aegean coast and at Constantinople. More important was the influence of the city republics of Italy, particularly Venice and Genoa, which made itself felt along the whole Balkan littoral from the Adriatic to the Black Sea. Finally, we will call attention to the significance of new Western influences which operated during the course of the nineteenth century. All these influences can be grouped under the name of Mediterranean and Western civilizations in contrast with the civilization of Central Europe, of which the influences, although recent, are becoming more and more important.

LIMITS OF WESTERN INFLUENCES

The routes of penetration and the geographical distribution of these two groups of civilizations are different. The Western civilizations reached the Balkan Peninsula chiefly by means of the sea routes and penetrated into the interior by the transverse routes which start from the Adriatic. Although Roman civilization, and even Venetian civilization to a certain extent, spread over a large part of the peninsula, their advance has finally been halted by the topography of the region, and they are at present limited to the narrow coastal strip, mainly on the Adriatic. It is the rugged relief of the country which has stopped the spread of these influences, just as it has prevented the spread of the Mediterranean climate toward the interior. As soon as one leaves the towns of the Adriatic coast, the Western influences disappear and the patriarchal régime becomes predominant.

EXTENT OF MEDITERRANEAN INFLUENCES

The Mediterranean influences are more or less noticeable throughout the whole Balkan littoral from Trieste to Constantinople. They belong essentially to the same civilization that is met with on all of the European coasts of the Mediterranean, modified to a certain extent by the different nationalities that occupy the coasts of the Balkan Peninsula. It has rather a Levantine and Greek aspect at Constantinople (particularly among the inhabitants of the suburb of Pera) and on the coasts of the Sea of Marmara and the Aegean. On the Albanian coast there is a mixture of South Italian, Greek, Turco-Oriental, and even patriarchal influences. On the Adriatic coast the urban agglomerations, the house types, and the manner of living bear a Mediterranean aspect, superimposed on a Serbo-Croat foundation. The ancient sway of Venice has dotted the landscape with ruins of small forts and other structures bearing the Venetian coat-of-arms and has impressed the republican spirit on the mentality of the city dwellers.

ITALIAN TRACES IN THE INTERIOR

The interior of the Balkan Peninsula even today is not entirely free from Western influences. Roman civilization has left its traces on the native population, the Illyrian and Thracian tribes who, in the area north of a line extending from Alessio to Ratiaria, became half Romanized. This ancient population was assimilated by the Serbo-Croats but left its traces on them. An important Serbian group in the Dinaric Mountains, the Eranclan, has mental traits very similar to those of the Latin peoples of Western Europe. Words of Latin origin have been introduced into the Serbo-Croatian language, probably by the old, half-Romanized Balkan population. A part of this population which fled before the Slav invasion into the central and eastern parts of the peninsula, has, according to certain linguists, greatly influenced the Serbian and Bulgarian dialects of those districts.

The relations of the republic of Venice with the Serbian kingdom of Rashka in the Middle Ages have also left traces in the interior of the peninsula. The Western influences in the architecture of Serbian churches of the twelfth to fifteenth centuries are well known. Numerous weapons and cloths of Venetian origin are mentioned in Serbian folklore, particularly in the folk songs. In the Serbian language there are words of Italian origin which probably date from this period (*piana, pogatcha, bisage*, etc.). The Dinaric regions and even the parts of Serbia along the Morava maintained commercial relations with Italy by the route of Ragusa as late as the end of the eighteenth century (export of cattle). The fine flour of Yakin (Aneona) and the flour pastes of Italian origin were still known in the Metohiya, the region of Pȇy, or Ipek, in the first decades of the nineteenth century. They were known even in eastern Bulgaria, probably introduced by Genoese merchants. At Karlovo, in the sub-Balkan depression, several ancient houses and shops of the Italian type were seen by the writer.

CATHOLICISM

There remains to be discussed the most important of the Western influences in the peninsula, Catholicism and the Latin alphabet which accompanied it. But a distinction must be made. It is only on the Adriatic coast that Catholicism was in constant connection with Western civilization. In Bosnia and other Yugo-Slav countries outside of the peninsula Catholicism has been allied rather with the civilization of Central Europe. In Bosnia particularly it was spread and supported from Hungary.

CENTRAL EUROPEAN INFLUENCES

The influences of Central Europe in the Balkan Peninsula hardly made themselves felt until the end of the eighteenth century. The temporary occupations of certain regions by Hungary in the Middle Ages did not leave any traces. After the Austro-Turkish wars and after the great

Serbian migrations of the Turkish period, the commerce of the northern part of the peninsula was directed towards Austria. The relations with this country became more and more numerous and varied and continue to do so to this day. German influence also begins to enter in the last decades.

The Magyars, people of the great Hungarian lowland, the Alföld, had hardly anything to do with the spread of Central European civilization in the peninsula. Hardly any Balkan inhabitant speaks Hungarian. The immense Hungarian plain is considered by the Balkan inhabitant a space to be crossed as quickly as possible without stopping. Hungary itself, in order to obstruct a closer contact between Serbia and the Yugo-Slavs of the kingdom, limited all relations with the Balkan Peninsula, even on the two railroad lines Belgrade-Fiume and Belgrade-Vienna. As a consequence a basin which is predestined by nature to serve as a link between peoples and to facilitate the propagation of civilization has played the rôle almost of an obstacle, hindering contact and the interchange of influences.

Nevertheless the civilization of Central Europe has penetrated along the valleys and longitudinal routes into Serbia and Bosnia and even into Bulgaria, although further removed, and has finally spread to Saloniki and Constantinople. It has reached numerous cities and even the villages of the valleys that are followed by the railroads and the more important roads. Its traces are superimposed on the traces of Byzantine civilization and the patriarchal régime. It finds expression mainly in the material side of life and increasingly in the tastes of the urban population. But the civilization of Central Europe has been able only in a limited way to influence the mentality and the spirit of the Balkan peoples, particularly those of the independent Balkan states. In Serbia the spirit of society is totally different. Numerous men have been trained in Western Europe, particularly in France, and the rest have also adopted Western ideas. The institutions, although based on national tradition and spirit, are more related to those of Western than to those of Central Europe. There is in the independent Balkan states and especially in Serbia a marked tendency to create, out of the various civilizational influences and by drawing on native resources, an original national civilization.

The case is not entirely the same in Bosnia and particularly in Croatia and Slavonia, where, in the large cities, foreign rule considerably impedes the maintenance of national tradition.

The Patriarchal Régime

The regions of the peninsula lying north of the Shar Planina and the Balkan Range belong in general to the patriarchal régime, excepting for the narrow Adriatic littoral and the northern plains of Serbia. South of this boundary large enclaves of the patriarchal régime exist in the moun-

tainous ramparts of the Sryedna Gora, the Rhodope Mountains, and the Pindus as well as in a large part of Albania. Other enclaves are those which have been discussed above.

We should not consider the patriarchal régime of the peninsula a régime without civilization. On the contrary, the population whose mode of life it is, is distinguished by moral conceptions of a high order and by other evidences of civilization. Its particular philosophy of life, its social and economic organization, and its well-developed institutions, its art and poetry are all of indisputable merit.

THE YUGO-SLAVS

The patriarchal foundation among the Yugo-Slavs dates from their settlement in the Balkan Peninsula at the beginning of the Middle Ages. Their organization in clans and *zadrugas* (i. e. communal associations of several families under one roof) weakened or disappeared under the influence of Byzantine administration and civilization as well as under the administrative system of the Yugo-Slav states of the Middle Ages. At the time of the Turkish dominion the Yugo-Slavs inhabiting the regions outside the zone of ancient civilizations reverted to the patriarchal régime. A certain ethnographic rejuvenation then took place: ancient social organizations and customs which had almost disappeared, revived and developed anew. But in spirit and content this patriarchal régime is different from the earlier one. The broad historical experiences of the Yugo-Slavs during the Middle Ages have left in their consciousness more or less profound traces. Left to themselves, the most vigorous of these patriarchal populations have drawn from these experiences definite opinions and moral sentiments which pervade their folklore and are evident in their actions. This development has been able to take place more easily and more completely among them than among the Yugo-Slav populations which remained subjected to Austrian and German influences.

CLAN AND "ZADRUGA"

The general characteristics of the patriarchal civilization as thus described are not the same in the various regions where the patriarchal régime obtains. The most notable differences are to be found in the social organization. The clan (*pleme*, pl. *plemena*, in Yugo-Slav; *fise* in Albanian) is to be met with only in Montenegro, in the regions adjacent to the ancient kingdom of Rashka, and in northern Albania among the Serbs and Albanians. The *zadruga* exists throughout the western and central portions of the peninsula from the Adriatic to the Isker River in Bulgaria, as well among the Serbs as among the Albanians. It disappears to the south as soon as one approaches the Greek population of the Aegean littoral. It is not to be found among the Bulgarians. It is lacking among the Turks.

The *zadruga* is still existent in all the Yugo-Slav districts of Austria-Hungary, particularly in Dalmatia, Croatia, Syrmia, the Batchka, and the





Banat. This institution was strongly reinforced by the Dinaric immigrants during the course of the Turkish domination.

Closely related to the social organization in clans and *zadrugas* are the phenomena of material life as well as numerous special mental traits. Almost all of the population belonging to the patriarchal régime has, more or less, been affected by Turco-Oriental influences.

INFLUENCE OF ROME VS. THAT OF CONSTANTINOPLE

Historians often maintain that a profound separation has taken place in the Balkan Peninsula between the zone of influence of Rome and that of Constantinople, particularly after the division of the Roman Empire into the western and the eastern empire under Theodosius in 395 A. D. The northwestern part of the peninsula, favored by its position and by its geographical characteristics, which facilitated penetration from the west, joined itself more closely to Western civilization, they say, while the greater part of the peninsula accepted Eastern civilization—the civilization of Byzantium. The results of these different influences, it is asserted, are still evident in our day. The most striking aspects of these differences are the Catholicism and the use of the Latin alphabet of a section of the Yugo-Slavs, as compared with the Greek-Orthodox faith and the use of Cyrillic characters by the majority of this race.

THE PATRIARCHAL RÉGIME VS. BYZANTINE CIVILIZATION

The present distribution of the different civilizations of the peninsula corresponds to a certain extent to this widely accepted belief. As a consequence of the migrations in the Turkish period and of the ethnographic rejuvenation of which we have spoken, the civilizational influences, both of the West and of Byzantium, have become effected in the regions north of the Shar Planina. The most pronounced boundary in this region is not the boundary between Byzantine and Western civilization, but that between the patriarchal régime and Byzantine civilization. Thus Balkanism, that is to say, Oriental influences and the influences of the ancient Byzantine civilization, becomes more and more marked as one advances from the Dalmatian Adriatic toward the Black Sea and toward Saloniki and Thrace. It is in the same direction that Balkan mentality and the passions which move the Balkan world become more and more marked.

CATHOLIC ENCLAVES

Mention should also be made of the islands of Catholic population to the west of the Bosna River in the midst of Greek-Orthodox and Moslemized Serb populations. But these Catholic islands themselves belong to the patriarchal régime. Besides, in so far as it is Catholic, this population is more related to Central Europe than to Western Europe.

The ethnic foundation of the patriarchal populations is the same among the Catholic Yugo-Slavs and the Greek-Orthodox Serbs. They are mixed north of the Save River as well as to the west of Bosnia. The migrations which took place in the Turkish period have brought numerous Greek-Orthodox Serbs into Croatia and Slavonia, where today they form a third of the Slav population. The Catholics themselves are descended in part from the Greek-Orthodox populations which were converted during the last centuries.

REGION OF UNBROKEN WESTERN INFLUENCE

The only region where Western influences exist practically without interruption is the Adriatic littoral, chiefly Dalmatia. But even on this coast Byzantine civilization had, after Roman civilization, taken deep root. Furthermore, Byzantine civilization was the basis of the Venetian civilization which penetrated the coastal region. Finally, a large Serbian population belonging to the patriarchal régime migrated to Dalmatia during the Turkish dominion and settled even in the cities. The awakening of Serbo-Croatian nationalism and the development of a native civilization have obliterated almost all, except the material, traces of Venetian civilization.

THE SUN AND THE WEATHER: NEW LIGHT ON THEIR RELATION

By ELLSWORTH HUNTINGTON

The psychology of great advances in science is most fascinating. As long ago as 1651, as we learn from Professor Helland-Hansen and Dr. Nansen in a recent elaborate monograph,¹ Father Riccioli, a Jesuit priest, announced that when sunspots are numerous the temperature of the earth's surface falls, whereas when spots are few the temperature rises. In 1801 the great astronomer Herschel confirmed this conclusion. Then in 1826 the Bavarian astronomer Gruithuisen showed that when sunspots are numerous the storminess of the earth increases. Thus a century ago the two main facts as to the relation between solar changes and terrestrial weather were already known.

The Greatest Meteorological Problem of the Day

THE ANOMALY

For a hundred years, however, there has raged a great controversy over this question—a controversy of ever increasing intensity. At last the work of many students, and especially the final tabulations of Köppen, published in 1914, have placed one phase of the matter beyond the possibility of question: the temperature of the earth as a whole falls when sunspots increase and rises when they decrease. At the same time the measurements of the sun's radiation made by Abbot and others are rendering it more and more clear that the sun emits more heat when sunspots are numerous than when they are few. Thus the anomaly of a warmer sun and a cooler earth appears now to be well established. Nevertheless, so far as the writer is aware, no weather bureau in any of the great countries of the world has officially admitted the truth of this relationship.

RELATION BETWEEN SOLAR AND TERRESTRIAL ATMOSPHERES

The controversy over the reality of a connection between the activities of the sun's atmosphere and that of the earth being almost ended, a new question has arisen. What is the nature of this connection? The conservative school holds that the connection must be purely thermal. An unusual supply of heat from the sun must warm the surface of land and sea. The warming of the sea must be of especial importance. This is

¹ Björn Helland-Hansen and Fridtjof Nansen: *Temperaturschwankungen des Nordatlantischen Ozeans und in der Atmosphäre: Einleitende Studien über die Ursachen der klimatologischen Schwankungen*, *Christiania Videnskapselskabet's Skrifter: Mat.-Naturv. Klasse*, 1916, Art. 9 (pp. 1-341), Christiania, 1917. The present paper is based on this important work on the relation between solar and terrestrial changes. See also Nansen's abstract in *Journ. Washington (D. C.) Acad. of Sci.*, Vol. 8, 1918, pp. 135-138.

partly because evaporation, cloudiness, and rainfall must thereby be increased, and partly because the heat received by the water, especially in equatorial regions, is transferred to other regions by means of ocean currents. As to the anomaly of a warm sun and a cool earth the supporters of this school offer various explanations. Some hold that increased evaporation causes increased cloudiness and thus shuts out the sun's heat, thereby lowering the surface temperature. This seems much like reasoning in a circle. Hence others believe that the oceanic circulation is so altered that more cold water wells up from beneath and thus the temperature of the surface is lowered. Still others, following Humphreys, believe that at sunspot minima, when the sun emits less than the usual amount of heat, the proportion of ultra-violet rays in the sunlight increases. This is supposed to be due to the relative clearness of the sun's atmosphere, which at such times is comparatively free from prominences or protuberances formed by clouds of gases at high altitudes. The ultra-violet light is supposed to increase the formation of ozone in the upper layers of the atmosphere. Ozone permits waves of short length, such as those of light, to pass through it easily. It hinders the waves of greater length, that is the heat waves which radiate from the earth into space. Thus the ozone is thought to act as a blanket and keep the earth warm at times of few sunspots, while at times of many spots the heat waves are allowed to escape.

THEORY OF THE RADICAL SCHOOL

The radical school rejects the idea that changes in the temperature of the earth's surface are the primary cause of the climatic variations which seem to be associated with changes in solar activity. They believe that the primary cause is found in the atmospheric circulation. The group of students who hold this belief in one form or another includes the two Lockyers, Bigelow, Veeder, Kullmer, and others; it is now re-enforced by the Norwegian authorities, Professor Helland-Hansen and Dr. Nansen, the Arctic explorer. The members of this radical group hold that when the sun is active it somehow causes changes in the upper atmosphere. Thus the distribution of atmospheric pressure is disturbed, the strength of the winds is increased, and especially the location, area, and relative intensity of centers of high and low pressure are altered. This causes such change in the strength and direction of the winds that corresponding changes in temperature occur, and the effect of increased solar heat may actually be reversed. Veeder, basing his opinion upon a study of centers of high pressure, believed that when the sun is active great masses of the upper air are transferred bodily to those centers. This air is supposed to descend and cool the lower atmosphere, while at the same time its movements disturb the atmospheric equilibrium and thus give rise to more abundant and stronger storms. The writer, basing his opinion upon a study of centers of low pressure, has come to a similar conclusion. He believes that at times

of solar activity the well-attested increase in the cyclonic activity of ordinary storms, thunder storms, tropical hurricanes, and the like carries great masses of relatively warm air to high levels. There it grows cool. Thus it radiates into space the extra heat received from the sun at such times. It even carries this radiation to such a point that the earth's surface is actually cooler at times of abundant solar radiation than at times when less heat is received and when the earth's atmosphere is less active. This belief, it will be seen, is essentially the same as Veeder's, the two being opposite sides of the same shield.

The radical group of meteorological students are often regarded by their colleagues as visionary. There is some ground for this opinion. The conservative group appeals to a motive force, or type of energy, whose efficacy is undoubted. The effect of heat can be seen by everyone every day in the year. Therefore the group of students who assert that thermal conditions are sufficient to explain all meteorological phenomena feel that they are on safe ground. The radical group is obliged to confess that in this respect it is at a distinct disadvantage. It is forced to appeal to some other motive energy whose mode of action is not so clear as that of heat. The sun emits light, heat, and the types of energy known as electrical, magnetic, and radioactive. Among these, aside from heat, the electromagnetic group is the most probable source of disturbances in the earth's atmosphere. Therefore the radical meteorologists generally believe that electro-magnetic energy must have something to do with the relation between the solar and terrestrial atmospheres. Nevertheless they do not yet know quite how their supposed force can produce the observed effects. They feel, however, that this difficulty is less than the difficulty of holding to a purely thermal hypothesis in the face not only of the great anomaly of a warm sun and a cool earth, but of many minor anomalies.

RADICAL AND CONSERVATIVE POSITIONS

One important point needs emphasis. The conservative school does not regard temperature as the solution of the whole question, nor does the radical school regard atmospheric circulation as the whole solution. The conservative meteorologists merely say that the chain of events *begins with temperature*. An unusual degree of heat on any part of the earth's surface causes changes in atmospheric pressure and also in the temperature gradients between different parts of the ocean. This leads to winds, ocean currents, storms, and precipitation. These in turn lead to further changes of temperature. Thus new conditions of atmospheric pressure and of oceanic gradients are established, and the wheel comes round full circle.

The radical meteorologists believe in exactly the same circle of events. They do not question the importance of changes of temperature. No sane man who knows how the seasons cause the most extreme changes in every kind of climatic conditions can possibly do so. They admit freely that

variations in solar radiation due to the differing angle of the noonday sun are the most important of all climatic phenomena. They also admit with equal readiness that any change in the amount of heat received from the sun is bound to have the effects claimed by the conservative school. The point where they part from their fellows is merely this: The temperature changes in the sun appear to them to be accompanied by changes of other sorts. These other changes apparently act more rapidly and violently than the thermal changes. They may mask or even for a time reverse the thermal effects, but this does not mean that they are any more important. The variations in the sun's heat may be compared to the currents caused by the ebb and flow of the tide; the other variations, whatever their origin, may be compared to the waves and currents raised by the wind. Both sets of activities must be understood in order that a ship may safely reach harbor. The sun's non-thermal changes apparently act directly upon the earth's atmospheric activity. Hence the radical school holds that the more noticeable effects of solar variations *begin with the circulation of the air* and thus produce changes in temperature, ocean currents, rainfall, and the like.

MEANS OF SETTLING THE CONTROVERSY

In order to settle the controversy between the conservative and the radical meteorologists four lines of investigation suggest themselves. First, we must study the earth's weather anomalies, that is the incidental variations such as the cold winter of 1917-18. In this way we must determine whether unusual climatic conditions begin with changes in the temperature of the earth's surface or with changes in the distribution of atmospheric pressure. The monograph by Professor Helland-Hansen and Dr. Nansen here under consideration is a study of this problem.

Second, we must carry on a more intensive study of the sun itself in order to determine how far the connection between its changes and those of the earth's atmosphere can be attributed to thermal conditions and how far it must be attributed to other causes. Such a study has recently been completed by the writer and will shortly be published in the *Monthly Weather Review*.

Third, if there seems to be ground for the radical opinion as to the importance of non-thermal solar variations, we must carefully review the sun's activities to see whether there is any sound physical basis for the idea that they can influence the earth's weather. The most elaborate attempt of this kind that has thus far been made is that of Veeder, which was recently described in these pages.² His results, interesting as they are cannot be accepted as conclusive. When he wrote some twenty-five years ago, neither the science of physics nor our knowledge of the problems

² Ellsworth Huntington: The Geographical Work of Dr. M. A. Veeder, *Geogr. Rev.*, Vol. 3, 1917, pp. 188-211 and 303-316.

mentioned under the two preceding headings was sufficient to permit of final conclusions.

Finally, when the supposed physical cause has at length been determined, it will be necessary to measure its occurrence in the sun most minutely and accurately—a thing which presumably has not yet been done. Only when such measurements are available can we compare them with the weather and apply the final tests which will solve the present controversy.

The Latest Contribution to the Settlement of the Problem

MATERIAL AND METHOD OF THE MONOGRAPH

Having thus surveyed the general outlines of the greatest meteorological problem of the present day, let us review the latest important contribution to it. Professor Helland-Hansen and Dr. Nansen, as we have seen, belong to the radical group. This, however, is not from any *a priori* theory, but because studies of the temperature of the Atlantic Ocean seem to them to leave no other alternative. Their monograph is one of the most careful meteorological studies ever made. It contains among other things a comprehensive and illuminating review of all the chief contributions to the subject of the sun's relationship to the weather. With this is a full bibliography which is sure to be of great value to the student. They also give tables relating to the temperature, barometric pressure, and wind of many parts of the Atlantic Ocean as well as of some other regions, such as Scandinavia and the United States.

The authors begin with an investigation of the distribution of temperature in the surface waters of the North Atlantic Ocean for the years 1898-1910. On account of the vast amount of labor involved, and also because this season gives the most accurate picture of the main changes from year to year, they limit themselves to three 10-day periods between February 3 and March 4, and three similar periods from March 15 to April 13. Data were collected from all the available ships' logs along the route from New York to the English Channel. Other data were used for the region surrounded by Norway, Iceland, and Scotland, and thence westward and southwestward, also for the oceanic region between Spain and New York and for areas in the equatorial Atlantic. In addition to this a great number of records from all parts of the world were drawn upon. In fact, one of the most impressive features of this monograph is its thoroughness.

OCEAN TEMPERATURES AND CURRENTS

The first question to be answered is whether there is any evidence that the temperature of the central parts of the North Atlantic varies in harmony with the temperature and rate of flow of the Gulf Stream and the Labrador Current. Surprising as it may seem our Norwegian authors

can find no clear evidence of this. That the Gulf Stream and the Labrador Current must have an effect upon the temperature of the Atlantic they by no means deny. The ordinary idea as to the effect of the Gulf Stream, for example, assumes that when unusually high temperature is found in a given area, it should gradually move eastward. The rate of movement has been supposed to be such that it takes a year or more for a given condition to pass from Florida to the neighborhood of the English Channel. Hence during the 60 days from the middle of the first to the middle of the last of the 10-day periods with which our authors work, the center of an unusually warm area, for example, should advance from a sixth to a tenth of the distance from Florida to the coast of France. Not once during the thirteen years covered by the investigation is this expectation realized. On the contrary, there is a pronounced tendency toward somewhat sudden and irregular changes. An excess of temperature is soon followed by a deficiency. This in turn may in a few weeks be followed by another excess. Moreover, the changes do not proceed gradually from west to east, but show a tendency to occur simultaneously over areas extending a thousand or more miles from east to west. As a result of this tendency we do not find a gradual change from above normal to below normal, or the reverse, as we pass from west to east across the ocean. On the contrary, the whole Atlantic, aside from the parts near the two continents, generally shows the same kind of departure. That is, at a given time all the central parts of the ocean are likely to be warmer or colder than normal, while the two borders vary in the opposite direction.

Having completed their study of the region between Europe and New York, Helland-Hansen and Nansen turn their attention to other parts of the world. They find, for example, that when the temperature is especially low along the route from New York to England, as occurred in 1904, the same condition prevails over a large part of the North Atlantic as well as over vast areas in other parts of the world. Moreover, so far as there is a progressive movement of warm or cold centers, it does not appear to coincide with the direction of the currents. For instance, in the eastern Atlantic changes in the surface temperature seem to progress from the Azores northeastward and thus across the currents.

TEMPERATURES AND WINDS

Having found that short-period changes of temperature do not occur in accordance with what would be expected on the basis of ocean currents, the authors next investigate the winds. They find that over the North Atlantic the temperature of the water varies closely in harmony with the barometric pressure, that is with the strength of the winds. Off the coast of Norway, where the temperatures of the water and of the land have been supposed to be closely dependent on the Gulf Stream, a careful investigation shows that this is not the case. Of course in the long run a change in

the Gulf Stream would be important, but, so far as the short changes from season to season are concerned, it is the wind that counts. The temperature of the coastal waters and of the air over the land varies in harmony with the wind. At Stockholm the changes in temperature are almost identical with those on the western coast of Norway. Moreover, as a rule the changes at Stockholm come a trifle earlier than on the west coast. Therefore we seem forced to the conclusion that "the immediate general cause of short changes . . . is undoubtedly to be sought in the changes in the atmospheric pressure."

WIDELY SEPARATED REGIONS

This conclusion leads our authors to still further investigation. In accordance with the method of 12-monthly overlapping averages so profitably employed by Arctowski they compare their curves for North Atlantic regions with those for other parts of the world. The relationships are extraordinary. In the first place a great body of data shows that places as remote as the North Atlantic in latitudes 40° – 50° , the equatorial Atlantic, Batavia in Java, Arequipa in Peru, and Bulawayo in South Africa are subject to almost the same synchronous series of small changes of temperature. In other places such as Honolulu the curve of temperature is almost the reverse of the Arequipa type. Between the two types there is every gradation. Moreover, a curve may suddenly change from one to the other. Such was the case on a wide scale about 1896. At that time a marked change of type occurred not only in temperature curves but in those representing atmospheric pressure and wind. According to Lockyer, a corresponding change in the sun, as indicated by the spectroscope, occurred at the same time.

SIGNIFICANCE OF THESE DATA

The significance of these many curves from all parts of the world lies in the fact that their uniform periodicity points to some great cause outside the earth. That cause can only be the sun. It can scarcely, however, be the changes in the amount of *heat* emitted by the sun. The reason for this belief is as follows: Changes in solar temperature must produce their greatest effect in those parts of the earth where the sun at any given season shines most nearly vertically or with the least hindrance from clouds. From such places the heat would gradually spread outward, especially in the direction of the prevailing winds or currents. Under such circumstances places farther and farther removed from the regions of greatest heating would show less and less effect, and the delay would be greater and greater as we get farther away from the starting point. In some cases this is what happens, and we may well conclude that under such circumstances we are dealing with the direct effect of changes in the sun's thermal radiation. Far more often, however, we find simultaneous changes in remote places with wholly different climatic characteristics. Thus at

the equator about 30° west of Greenwich the ocean off the west coast of Africa undergoes changes of temperature almost identical with those about 45° farther north and about 45° west of Greenwich, that is off Newfoundland. Half way between these two places, however, the changes of temperature are almost exactly the reverse. It is noteworthy that at the equator and in latitude 45° N. in the Atlantic Ocean *low* pressure prevails permanently, while in the intervening region there is an area of permanent *high* pressure.

Similar instances might be multiplied. They seem to show that Hildebrandsson is right in his idea of centers of action. Apparently solar activity produces two kinds of effects, one in areas of high pressure and the other in areas of low pressure. Therefore the curves showing the changes of temperature from month to month in the two regions are reversed. In intermediate regions there are likely to be transition types. In places near the limits of the various centers of barometric action, predominantly high-pressure conditions may prevail at one time and low-pressure conditions at another. Thus mixed types of temperature curves may be produced. In this way what seems at first to be a perfect chaos, full of interminable contradictions, falls into an orderly and systematic sequence. It falls into such a sequence, however, *only if we admit that the primary effect of solar changes is to cause variations in atmospheric pressure*. If the sun's variations are primarily thermal, the chaos still remains chaos.

CRITICISMS OF THE AUTHORS' CONCLUSIONS

This general conclusion of Helland-Hansen and Nansen seems to be wholly in accord with the evidence. In certain minor respects, however, their conclusions are open to question. For instance, they conclude that at times of sunspot maxima the extremes of temperature from day to day and season to season are no greater than at other times. This is directly opposed to the conclusions of Hann, Liznar, MacDowall, and Easton, all of whom are quoted by our authors. It seems also to be opposed to the evidence presented in the book under discussion by the authors themselves. Their curves of the difference between the warmest and the coldest months in various parts of the United States show a considerable resemblance to the sunspot curve, especially when all sections of the country are combined. They show a still greater resemblance to the curve of solar protuberances.

Another point which seems open to possible criticism is the effort of the authors to find exact periodicities. Thus they speak not only of periods of 14 and 27 days due to the sun's rotation, but of periods of 4, 8, and 12 months, periods of 2, 2.7, and 3.5 to 4 years, periods of 5 to 6, 11, and 33 to 35 years, and many other periods which slip from the memory. It may be that all these periods are real. It is certainly most fascinating to work with them. Almost everyone who studies sunspots or the weather is

lured on and on by the way in which the same phenomena repeat themselves in cycle after cycle. Thus far the net result of studies of this problem seems to be that we have not discovered a single period whose duration and character are such as to make it of practical value. We talk about sunspot periods of 11 years, but they vary from 7 or 8 to 14 or 15 years, and no one can do more than guess as to the length of the next one. The fact seems to be that while the changes in the atmospheres of the earth and the sun are cyclic they are not periodic. That is, the same phenomena keep recurring in cycles of every conceivable magnitude, but they do not recur after the lapse of any definite period. Every one of the apparent periods prevails for a short time—that is for a few cycles or perhaps a score—and then disappears.

WHAT IS THE REAL CHARACTER OF THE SUN'S ACTIVITY?

The consideration of cycles leads to the part of the book which the critic is sure to seize upon. Helland-Hansen and Nansen fail to show as close agreement between solar and terrestrial changes as between terrestrial changes in widely separated parts of the world. Only where the temperature of large numbers of stations is compared with the area of sunspots according to Köppen's method do we find an unmistakable and uniform relationship, extending over a long period. The promptitude with which similar temperature changes appear at short intervals in corresponding pressure areas in remote and unconnected regions is enough to prove that we are dealing with the results of solar activity. Nevertheless the apparent relationship between sunspots and the terrestrial temperature or pressure at individual stations keeps breaking down. The same is true when curves for solar prominences or for variations in magnetic intensity are substituted for sunspots. Each of these types of curves shows certain marked resemblances to the meteorological curves, but none shows the resemblances through long periods. The curve for the solar constant is equally unsatisfactory. In none of these cases, however, is there cause for surprise, as our authors well show. The fact is that although the relation between the sun and the earth seems proved, we do not yet know with what kind of solar activity we are dealing. The active agency is apparently not sunspots themselves, it is not the sun's magnetic action, it is not solar prominences, nor is it the solar constant. Each of these doubtless has some effect. Each is probably closely related to the force for which we are searching. Possibly all these solar phenomena are in themselves merely the effects of some greater, deeper cause, which also acts upon the earth's atmosphere. The authors have done the first part of their work so well that it is to be hoped that they will now take up this next step in the great problem of the relation of the sun to the weather.

THE RAINFALL OF JAVA

By MARK JEFFERSON

The strong influence of relief on rainfall is well known. Hellmann's superb "Regenkarte von Deutschland"¹ renders Germany the best of all examples, with its 3,000 stations in a land of 209,000 square miles, just as South America is the worst, with its less than 500 stations in a continent of 7,000,000 square miles area. Dr. W. van Bemmelen, director of the meteorological observatory at Batavia, has actually outdone the German record in a recent work on the rainfall of the interesting island of Java,² citing 1,060 rain stations in an island of 50,000 square miles area. Of course Java's position close to the equator and the high relief of this island of volcanoes make this study one of especial interest. Dr. van Bemmelen refers to a map of rain distribution in Java that he published in 1908, with fewer stations and a shorter series of observations. He did not then venture to draw isohyetal lines—their complexity being obvious—but printed the rainfall numbers on the spot of observation upon a map showing the relief of the island. The result was not very expressive. To be sure one could manage to make out by studying this map the relation between the rainfall and the relief, but only by close and painstaking study. The total result of such study is precisely what would have been shown much better and apprehended more readily by isohyetal lines.

Now that the author has more stations and a lengthened series of observations he has attempted to draw isohyets on a coarse scale for the whole island, with very interesting results. As the work is not likely to be generally accessible, the three principal maps are here reproduced. The atlas contains seven maps on the scale of 1:1,500,000, with the exception noted: (1) shaded relief, 1:1,000,000; (2) mean annual rainfall in tints with isohyets for 1, 1½, 2, 3, 4, 5, 6, 7, and 8 *meters*; (3) mean *monthly* rainfall for July, August, and September in tints with isohyets for 2½, 5, 10, 20, 30, 40, and 50 *centimeters*; (4) mean monthly rainfall for December, January, and February in the same tints; and (5), (6), and (7) the same for October-November, March-April, and May-June. The relief map further indicates the location of all rain stations and the boundaries of the Residencies.

Our Figure 1a shows the mean annual rainfall of Java for the extra-

¹ 1:1,800,000, Reimer, Berlin, 1906; also accompanying G. Hellmann: *Die Niederschläge in den nord-deutschen Stromgebieten*, 3 vols., Reimer, Berlin, 1906.

² W. van Bemmelen: *Uitkomsten der Regenwaarnemingen op Java*. Uitgegeven in opdracht van het Gouvernement van Nederlandsch-Indië, xxiii and 173 pp., Batavia, 1914; with "Regenatlas," 7 plates, Topografische Inrichting, Batavia, 1915. See also the discussion by B. C. Wallis in the *Scottish Geogr. Mag.*, March, 1917, pp. 108-119.

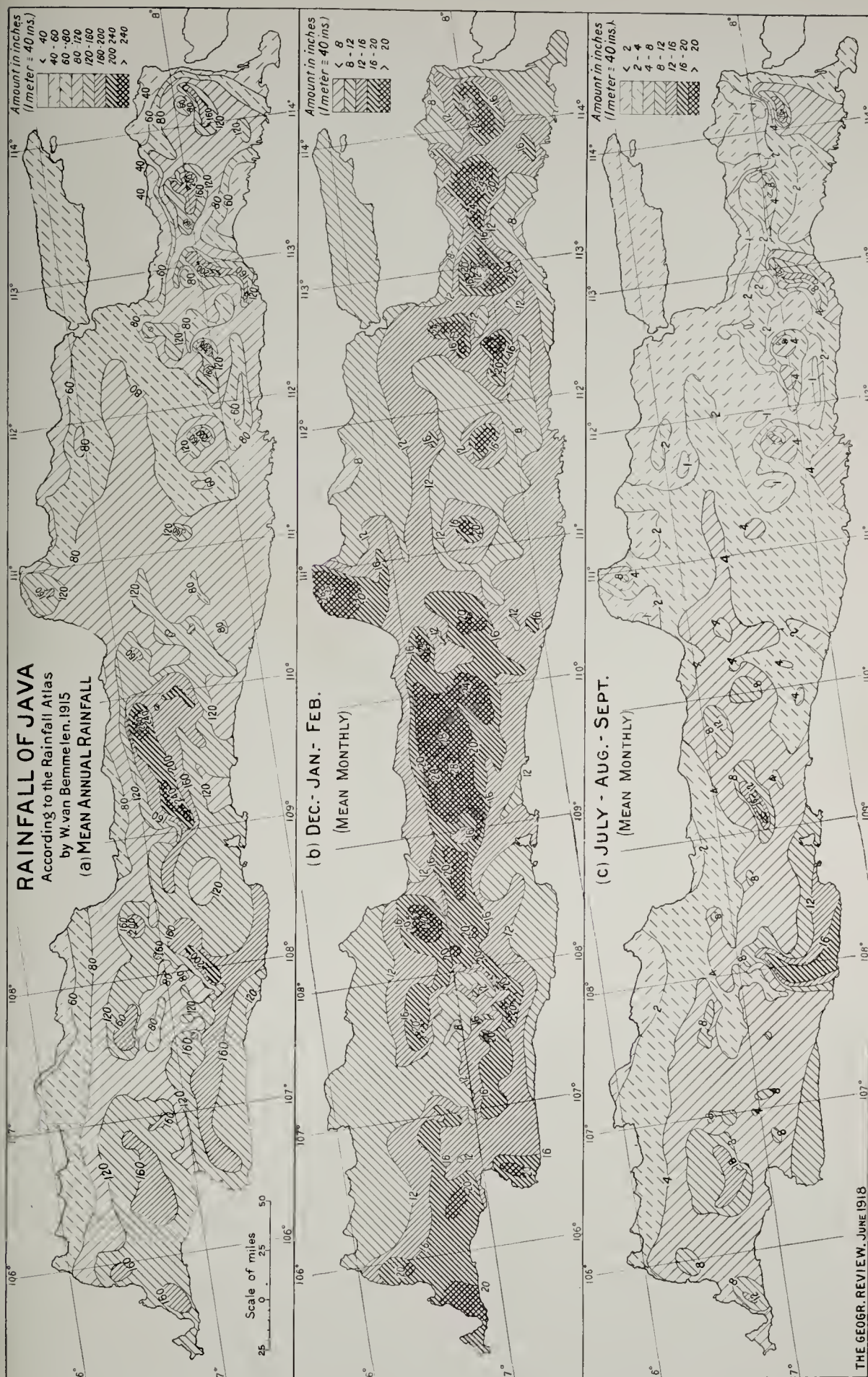


FIG. 1.—Three maps showing the rainfall of Java: (a) mean annual; (b) mean monthly for December, January, and February; (c) mean monthly for July, August, and September. Scale, 1:11,500,000. Based respectively on Pls. II, III, and VI of van Bemmelen's rainfall atlas of Java, 1915 (for title see footnote 2).

ordinary interval of 40 inches, which we have put for van Bemmelen's meter, a coarser rain-grading than the reviewer ever encountered and quite appropriate to this land of giant relief and enormous rainfall. The maximum rainfall reported for one year is 332 inches (8,305 mm.) at Kranggan in Banjoemas Residency, among the west-central mountains, and the least is 35 inches (882 mm.) at Asembagoes in Besoeki Residency, at the north-east corner of the island.

Decidedly Java is wet. Remember that Cherrapunji has but 474 inches and that the new coast record at Cape Anjeles in southern Chile hints at barely 500 inches for the southern Andes. The mean annual rainfall on the west slope of the mountain mass, G. Slamet (109° E.), is 320 inches.

Figure 1a shows more than 200 inches of rainfall along the whole of that massif from 109° to 110° E. Eight smaller mountain summits attain the same amount at points scattered along the eastern three-quarters of the island, as indicated by the patches

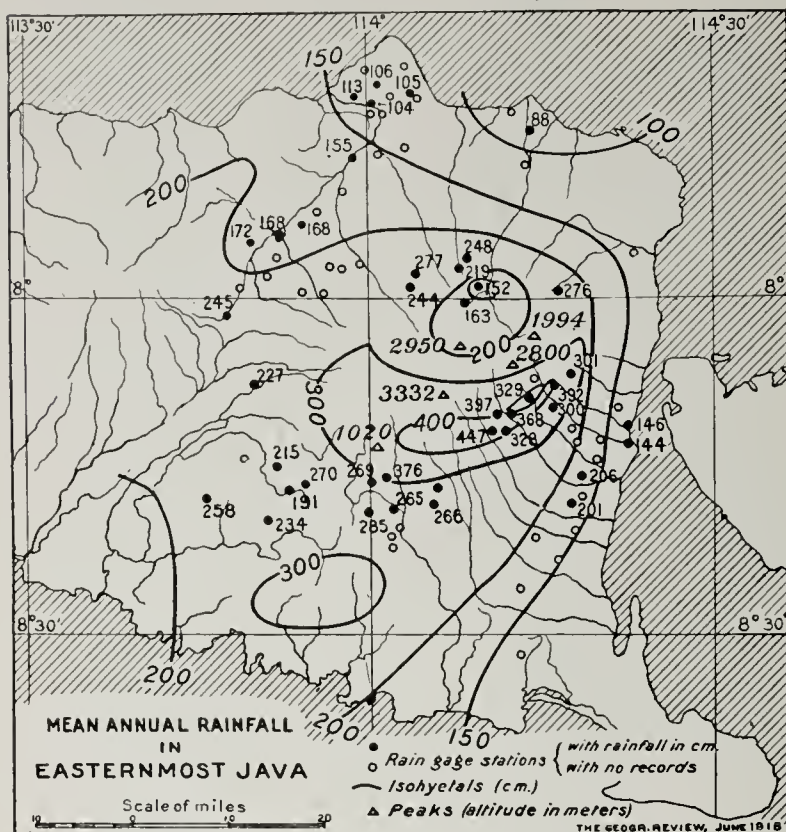


FIG. 2—Map showing in detail the mean annual rainfall at the eastern end of Java. Scale, 1:1,700,000. The rainfall amounts were plotted according to the text accompanying the atlas (see footnote 3) and the corresponding isohyets were then drawn. These show that the isohyets on the maps in the atlas are rigidly based on the records (cf. Fig. 1a).

of darker ruling. The heavier rainfalls can be seen to the southwest of the main heights, with striking rain shadows to the northeast. Very striking rain shadows are near 7° S. and 108° E. (80-inch patches) and near 8° S. and 114° E. (60-inch patch). On this map the whole distribution of rainfall looks as if the rain came from southwesterly winds blowing against the mountain slopes. This is also the case with the rain map for December, January, and February (Fig. 1b). In July, August, and September (Fig. 1c) much less rain falls, and it looks rather as if it came on a southeasterly wind.

In neither case is there good agreement between the appearance of the map and the prevalent winds, which would seem to indicate that the rain falls from exceptional winds rather than from the prevalent ones, as it does in most parts of the United States and in many other parts of the world.

Our Figure 2, based on the text,³ gives the actual figures used in drawing the isohyets in Besoeki Residency among mountain masses ranging from 1,020 to 3,332 meters and seems fully to justify Dr. van Bemmelen's isohyets. The complexity of these Java lines of equal rainfall contrasts admirably with the smooth ones of South America, where advancing knowledge has yet to put many a crook in the lines. The reason for using mean *monthly* instead of quarterly values of rainfall in the seasonal maps is that the seasons here made use of are of unequal length—two, three, and four months. The text contains abundant tables and discussions in English as well as Dutch.

³ Pp. 73, 75, 77, 79, upper half.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Award of the David Livingstone Centenary Medal to Colonel Rondon. At a special meeting of the Society, on May 15, at Carnegie Hall, Fifty-seventh Street and Seventh Avenue, the David Livingstone Centenary Medal for 1918 was awarded to Colonel Candido Mariano da Silva Rondon of Rio de Janeiro, Brazil. The occasion was made noteworthy by the addresses of His Excellency Senhor Domieio da Gama, the Brazilian Ambassador, and Colonel Theodore Roosevelt, and by the presence of a large number of distinguished guests, including the members of the Brazilian Military Commission to the United States.

President Greenough presided. In introducing the Brazilian Ambassador, Mr. Greenough spoke as follows:

"As President of the American Geographical Society I have been asked to say an introductory word, and it shall be very brief. The purpose of the meeting is twofold. First, to view the picture exhibit prepared and presented now for the first time by the Brazilian Government for the American public. I shall not enlarge upon this subject for the reason that our distinguished fellow-geographer who is to address us will comment upon it and he always illumines every matter upon which he touches. I confine myself to an expression of the gratification felt by our Society that we have been selected by that Government as the medium for initiating its enlightened undertaking, together with our profound appreciation of the honor conferred by His Excellency the Ambassador from Brazil by assisting in our proceedings tonight.

"The second incident of the meeting is the bestowal of the Society's gold medal upon Colonel Rondon, the eminent geographer and soldier of that great republic. The language of the award inadequately summarizes his many accomplishments, but it reads as follows:

'To Colonel Candido Mariano da Silva Rondon of Brazil,

'During a prolonged period spent in the service of his country he has contributed more than any other investigator to an accurate and extended knowledge of the geography and resources of its interior. His explorations as Chief of the Brazilian Telegraphic Commission inaugurated the development of vast territories with great advantage to his government and to his people.'

"In the absence of Colonel Rondon the Ambassador has kindly consented to receive the memorial in his behalf, and he has likewise promised a few remarks concerning the career of the recipient, his countryman. It remains therefore for me only to hand him the medal, with the Society's grateful acknowledgment of his courtesy, and to introduce to you His Excellency, Senhor da Gama, the Brazilian Ambassador."

In reply the Brazilian Ambassador spoke as follows:

"I understand that there is no modesty by proxy. Therefore my sentiment on receiving this medal in recognition of the services rendered by Colonel Rondon to geography and civilization is one of undiluted pride and gratification. I presume to know what my illustrious countryman would say if he were here in person. The difference between dreams and their realization may make a man feel undeserving before his own conscience. But an outsider, seeing the work done, only can admire it and applaud any mark of appreciation of these same results that seem so poor when gaged by that mighty desire that impelled the man into action. In other words, I think that Candido Mariano da Silva Rondon fully deserves the honor that is bestowed upon him by the American Geographical Society, and my gratitude even hesitates between the giver and the receiver, the one for having conquered, the other for generously conferring the prize for his deeds.

"I shall not try to explain to you the Brazilian point of view of the meritorious task undertaken by that military engineer, whose life has been one of practical and almost saintly philanthropy. Colonel Roosevelt knows that better and may tell you, with his personal authority and more to the point, what I could only faintly indicate.

"For he was there and saw Rondon at work among his Indians. I do not know much about Indians, unless it is that we used to call them wild, and some of them

really are; also that they are puzzling, as most simple things. But there are people who believe in Indians, believe that they are like ourselves, only different. You know what I mean. Colonel Roosevelt is one of those men whose heart is big enough to love men of other races. And loving them he goes around the world to see where and how they live. No wonder he happened to meet that other philanthropist, engaged in his assiduous task of opening telegraphic communications and reducing wandering savages into permanent villages, in the backlands of Brazil. He met him, they became friends and did great things together. From our ungrateful Amazonian jungle Colonel Roosevelt brought a beautiful book, and a bad fever that almost killed him. Even if the book remained, it would be too high a ransom for the joy of a beautiful adventure and a good action.

"Ladies and gentlemen, we Brazilians owe to your ex-President a debt of eternal gratitude. He knew that we existed and wanted to see us at home and, because he liked us, wrote about our land and our men and their work for the good of that land, spoke of such as Osvaldo Cruz and Rondon as representatives of a spirit that would honor any nation, and it was as though we were shown to ourselves. The river Roosevelt, put on the map after its exploration by the scientific commission Roosevelt-Rondon, is not the only mark left of his visit to Brazil. The irresistible attraction of his generous and sympathetic disposition created among us a desire to return in deeds the credit that he gave to our people of being humane and progressive. The man who shared with Candido Rondon perils and glory is the more competent to speak to Americans of their common work under the equator, a work which cemented a friendship that we look on as a symbol of the friendship between our nations."

Thereupon President Greenough, in introducing Colonel Roosevelt, said:

"We are now to listen to an address by our eminent fellow-geographer and medalist, but we cannot forget that he stands at the same time pre-eminent in the nation's regard as statesman, as soldier, and as an inspiration to action and to sacrifice, in this crisis of our country."

Colonel Roosevelt delivered the principal address of the evening, giving a thorough review of the work of Colonel Rondon and his associates on the Brazilian Telegraphic Commission. He commented particularly upon the philanthropic character of Colonel Rondon's work and the large share of credit he deserves not only in the organization and conduct of the Roosevelt-Rondon Expedition of 1914, but also in opening up the interior of Brazil through the building of telegraph lines and the development of the natives. Colonel Roosevelt gave a brief description of the principal regions covered by his own expedition and the government expeditions of Colonel Rondon, which were fully illustrated by the moving pictures that were subsequently shown. In closing, he paid a graceful tribute to the modesty and courage of Colonel Rondon and to his extraordinary ability in gaining the confidence of the savages and inducing them to adopt more settled ways of life.

The representative of Colonel Rondon, Mr. Luiz Reis, followed Colonel Roosevelt's address with an exhibition of a series of moving pictures showing the interior of Brazil, native fishing operations, river navigation and a number of ritualistic ceremonies and dances of the Parecí, Nhamiquara, and Coroado Indians. The pictures were remarkable for their originality and scientific value and were accompanied by interpretative music.

In addition to the special music there was also a musical program consisting of the Brazilian national anthem and a Brazilian composition entitled "Guaraní" by Gomez, as well as the national airs of the Allies.

NORTH AMERICA

The Social Relations of Forestry. Exploitation of our forestal resources still remains a notorious example of that destructive economy well described by the German term *Raubwirtschaft* (Ernst Friedrich: *Wesen und geographische Verbreitung der "Raubwirtschaft," Petermanns Mitt.*, Vol. 50, 1904). With the physical consequences of forest devastation we have been made familiar; certain economic results are obvious; but little attention has been paid to social effects. Yet the forest directly concerns a large percentage of the population of the country: the last census accredits the lumbering industry with its allied branches of logging, milling, and manufacture with the employment of over 900,000 persons or 13.7 per cent of the wage-earners of the country. (S. T. Dana: *Forestry and Community Development, U. S. Dept. of Agric. Bull. No. 638, Forest Service, 1918.*)

Because of its destructive method lumbering remains a roving industry employing

nomadic labor. The lumberjack, for whom a permanent home and normal family life are impossible, falls in the same class as the nomad prospector of minerals. In many ways the present form of our forestal industry closely resembles mining. Like mining it creates the "mushroom" town. A good example is described by Mr. Dana. In 1893 five or six families were living on the site of Cross Fork in a then wooded spot of the strongly dissected plateau of northern Pennsylvania. Lumbering commenced. Around the big saw-mill grew up a town of 2,000 people. Prosperity lasted as long as the lumber supply. In 1909 the saw-mill shut down, the railway ceased running, and today Cross Fork is a hamlet of 60 persons. Similar instances may be found all along the trail of lumber exploitation from east to west. Only where agricultural lands strongly predominate or where there have been opportunities for industry along new channels have towns and cities built on lumbering survived. Abandoned farms may frequently be seen in the vicinity of such deserted villages. Sometimes farming has only been practicable with the forest as a supplementary source of income; sometimes it has been the matter of a local market. Even where forested land is suitable for agriculture hasty removal of the forest is to be deprecated. In Wisconsin there are 10,000,000 acres of cut-over lands of which three-quarters may be classed as agricultural but at the present rate of improvement it will be 150 years before they are brought under cultivation. In the meanwhile the land might be producing from one to three timber crops. Another social ill to which the cut-over land is peculiarly open is speculation and fraudulent land dealing. The history of the delinquent tax lands of the Michigan sand barrens is an eloquent example.

In opposition to the anti-social consequences of treatment of the forest as a "mine" are the possibilities of community development under treatment of the forest as a "crop," that is by true forestry. This will require a revolution of the present system. There will be needed an adequate system of land classification, recognizing economic as well as physical conditions, and a stable forest policy.

A New Agricultural Census in Connecticut. With the view of ascertaining roughly the agricultural outlook in its territory this year, the Litchfield County (Conn.) Farm Bureau undertook a farm survey of the county along original lines. The results were so helpful and the information secured so timely that the survey will probably be continued annually.

The survey was made by the local farmers in each town, under the general direction of county supervisors, each of whom was responsible for two towns. No questions were asked that dealt with values. The plan of the survey was to find the actual stock conditions for 1917 and 1918 and the acreage of significant crops for last year and in prospect for this year. Every farm of over five acres was listed, and the results were tabulated by the State Library at Hartford. The State Council of Defence supported the work in many ways, especially through printing the necessary blanks and in the appointment of the town chairmen of the local census enumerators. The actual enumeration was done by the farmers, all within one week.

The most significant problem before the county this year is the raising of small grains for home and stock use. The census has shown that there will be 10,500 acres of small grains this year in the county—an increase of 70 per cent over last year. The acreage of corn, oats, rye, wheat, barley, and buckwheat is also known.

With these facts in hand, the County Farm Bureau and others interested have taken up a detailed survey of harvesting, threshing, and milling machinery, with a view to the best use of the same at the proper season.

The census proved so successful that three other counties of the state later took farm censuses in a similar way. The results obtained are sufficiently accurate for the use that is to be made of them. This year's experience will make the next census still better and perhaps assist in making the 1920 National census more satisfactory, at least with reference to agricultural items.

The unique feature of the survey was that it was carried out by local men, who knew local conditions and realized the practical results to be obtained. Each step in the preliminary organization was taken according to a regular schedule so that there was no delay in carrying out the details.

R. E. DODGE

Sea Breeze on Long Island. Long Island offers peculiarly favorable conditions for a study of the sea breeze, and it is somewhat surprising that up to this time no important local investigations of this interesting wind have been published. The results of observations made by means of a thermograph at Mecox, about two miles south of the village of Bridgehampton, Long Island, have recently been charted and discussed by Ernest S. Clowes (*Monthly Weather Rev.*, Vol. 45, 1917, pp. 345-346). The distance of the instrument from the ocean was about a quarter of a mile by the shortest line and

about one-half to three-quarters of a mile in the prevailing direction of the sea breeze (southwest). The effect of the sea breeze upon the temperature curve is rather slight, but distinctly noticeable. A curious flattening of the curve between 8 and 9 P. M. is characteristic. Some days show a higher temperature at 9 than at 8 P. M. This results from a cessation of the sea breeze about sunset and a turn of the wind toward the land.

R. DEC. WARD

California Coast Fogs. The importance of fog in navigation along the California coast is strikingly evidenced by the following fact. The Marine Exchange of the San Francisco Chamber of Commerce was asked what proportion of the shipwrecks which occur along the coast of California are due to fog. The answer was, "All of them." High winds and violent storms are rare. Fogs are the greatest danger to navigation. They are the chief contributory cause of the majority of marine disasters. Recent extensions and improvements of the fog-reporting service of the Weather Bureau have made possible a more detailed and more accurate study of fog conditions than could be made until now. Mr. Andrew H. Palmer, of the U. S. Weather Bureau at San Francisco, has prepared some new statistical tables and has briefly discussed the data ("Fog along the California Coast," *Monthly Weather Rev.*, Vol. 45, 1917, pp. 496-499).

Two types of fog have long been recognized on the California coast, summer fogs and winter fogs. In summer a fairly persistent fog bank hangs alongshore, extending seaward about 50 miles. The average vertical thickness is 1,500 feet. A vertical extent of 2,000 feet is rarely exceeded. During the summer months the excessive heating of the land causes an indraft of air from the ocean to the west. The inflowing wind reaches velocities of 25 or 30 miles an hour on summer afternoons near the Golden Gate. The westerly wind carries the fog onto the land, but it is usually dissolved, or becomes "high fog" or cloud before it penetrates far inland. These summer fogs seem to be due chiefly to the mixture of air masses which differ in temperature and in relative humidity. The temperature of the mixture is below the dew point, and condensation results. Along the coast there furthermore is an upwelling of cold water, similar, it may be noted, to the conditions off the coasts of northern Chile and of Peru, of north-western Africa, and of the Somali coast. During the summer, with generally light winds, the air over this cold water is also cold and nearly saturated. The prevailing westerly winds, reinforced by the indraft towards the hot land, blow across this cold water. These westerly winds are themselves nearly saturated but are slightly warmer than the cold air with which they mix. The mixture of these two air masses, both not far from their dew points, produces the condensation. These fogs seldom produce measurable precipitation, but are of great benefit to vegetation, as, for example, to the redwoods, which are limited to a narrow coastal strip in the fog region and never extend more than 30 miles inland. This summer type of fog sometimes occurs in winter but is rare then because the air is cooler than the water.

Winter fogs are of land origin. They are radiation fogs. They occur in all parts of California and occasionally move seaward, without going far offshore. They are thin (100-200 feet vertical extent); occur under weak gradients; and form at night. "Tule fog" is the local name for these winter fogs in California, because they are so frequent over swamps and marshes filled with tule (Mexican bulrush). Tule fogs last until they are "burned off" by the sun or are displaced by the wind.

R. DEC. WARD

SOUTH AMERICA

The Public Lands of Argentina. The problem of public lands in Argentina somewhat resembles that confronted by United States in the middle of the last century. A yearly immigration of some 300,000 people (pre-war figures) is fast filling up the already well populated districts about the ports of entry, while immense tracts of undeveloped lands lie idle in the interior. There are still about 240,000,000 acres of Argentine lands awaiting settlement. For some years the government has been attempting to induce colonization of these territories. By the law of 1907 farms of 250 acres each were offered to those who would occupy and improve them within two years. Pasture lands, unsuited to agriculture, were to be granted in blocks of 6,250 acres. In order to check speculation no person or corporation was allowed to acquire more than one pasture and two agricultural lots. A system of leasing made possible the temporary occupation of large grazing areas (*Bull. Amer. Geogr. Soc.*, Vol. 46, p. 441).

A new law, called by the English name "homestead," has recently been enacted (see *Commerce Repts.*, April 5, 1918). It is modeled on the lines of the homestead measure under which most of our western states were settled. If left as now approved it should help to bring about an important reform in the Argentine land system.

Argentina, with its semi-arid prairies, has always been a land of large estates. Such

immense grants of grazing land were assigned to the favorites of the early Spanish conquerors that within less than a century after their arrival almost all the country that lay within reach of the great highways from Chile, Paraguay, and Alto Perú had been claimed by their descendants. During the colonial period there was little development of these estates except in the immediate vicinity of the scattered towns. Indians still occupied much of the country, while herds of wild cattle and horses roamed over the unfenced *pampa*. (For an account of the *pampa*, see the paper by W. S. Tower in the April, 1918, *Review*). In 1878, after successful campaigns against the Indians had opened up extensive tracts of new lands, politicians and military favorites profited by the opportunity of securing large grants as rewards for their services to the country. The high rents charged for farms near centers of population sent a wave of land seekers out over these recently acquired territories. The government sold land in blocks of a square league at a nominal price. Great numbers of new *estancias* were established, and wild speculation in real estate created many of the great Argentine fortunes. For some twenty years this rapid expansion continued, but cattle raising for hides, tallow, and salted meat was the chief concern of the land-holders: a business that required extensive grazing estates. Only in 1898 did agriculture become of sufficient importance to demand a minister in the Cabinet. About the same time fine stock-breeding and dairying began to take the place of indiscriminate herding. These changes were made possible, if not actually brought about, by rapid growth of immigration. With the passing of the herdsman days there has come a marked tendency to divide up the great estates, particularly in the vicinity of the denser population centers. This is most noticeable in the province of Buenos Aires, where holdings of from 450 to 750 acres have grown much more common in recent years, and where there are many farms of even smaller size (see Argentine Year Book, 1915-1916, pp. 228-229).

The law recently passed is designed to prevent the creation of large estates in the regions to be settled. Each homestead is limited to from 50 to 450 acres, and is to be inalienable during the life of the recipient and until his children become of age.

Much of the country offered for homesteading is, moreover, purely agricultural rather than pasture land. Hence there will be less tendency toward the formation of large farms. In the Chaco and Misiones territories, where some 37,000,000 and 2,500,000 acres respectively are still open for settlement, yerba mate, tobacco, rice, and cotton can be raised. The Chaco is probably one of the most promising regions of South America for the development of cotton culture, as its climate and soil are well adapted to the cultivation of that plant. The territory of Chubut, in southern Argentina, about the latitude of New York State, will yield fruits and cereals, but, according to Bailey Willis ("Northern Patagonia," p. 290), its future industries will be chiefly dairying and high-grade cattle raising, for both of which it is well suited.

THE WORLD AS A WHOLE AND LARGER PARTS

The World Production of Hard Fiber. From time immemorial the Indians of Yucatan have used the native henequen fiber for the making of ropes, but the commercializing of this now famous Mexican product goes back only a few decades. Its present importance, indeed, may be said to date from the Spanish-American War, when the export of Manila hemp was temporarily cut off. Today henequen fiber supplies almost exclusively the ever-growing demand for binding twine, and the ancient Maya industry is now related to the wheat fields of the world. Troublesome times in Mexico together with the present world crisis have emphasized the dangers of such a monopoly (Paul V. Collins: *America's Grain Imperilled*, *Amer. Rev. of Reviews*, June, 1917).

The remedy is alternative. There is a possibility of extending the cultivation of henequen to other areas, or of substituting other fibers. The former method is already being pursued to some extent. Cuba has small amounts of fiber for export; so have some of the Central American countries, and one notes a proposed extension of the culture in Honduras (*Commerce Repts.*, July 17, 1917).

Other hard fibers now being produced are entirely consumed in the ordinary cordage and textile industries and in the extraordinary production of war material; supply barely meets demand, and prices have risen abnormally (*Commerce Repts.*, June 8, 1917). The world's production of hard fiber was distributed thus in 1915: abaca, or Manila hemp, 140,000 tons from the Philippines, 6,000 tons from Java; henequen or Yucatan sisal, 135,000 tons from Mexico, 3,000 tons from Cuba; sisal, Java 6,500 tons, Bahamas 4,300, British East Africa 3,750, Hawaii 1,000, Portuguese East Africa, 600 tons; phormium, 23,225 tons from New Zealand. The total of this estimated production is 317,975 tons. Perhaps the greatest promise for future development is held by East Africa. Before the war German East Africa, where cultivation had been introduced in 1893, led in the production of sisal, with an annual export of about 20,000 tons (none in 1915). In

British East Africa where commercial planting only commenced in 1907 progress had been satisfactory until the military campaign consuming an immense amount of native porter service drew labor away from the fields. With the resumption of more ordinary conditions and with large new areas now coming into bearing greatly increased production is anticipated from this region.

Worldwide attention is also being given to the production of new fibers. French West Africa reports an investigation of the "da" fiber (*Commerce Repts.*, June 4, 1917), while the North African colonies have great hopes for the successful utilization of their "alfa" grass. And there exist vast possibilities in Brazil not only for the utilization of the numerous wild fibers of the northern forests but also for the systematic cultivation of such fiber plants as those of the agave (sisal) species (*Commerce Repts.*, Jan. 26, 1916). The agave, a typical plant of the desert or semi-desert, suggests itself as a particularly appropriate product for the arid state of Ceará where periodic droughts cause temporary suspension of industry and enforce a general immigration. Besides supplying the market with cordage and twine the prospective Brazilian fiber industry might well be developed in relation to the greatest economic business of the country. A native fiber coffee bag could with advantage replace the imported jute article.

Successful experiments on sisal cultivation are also announced from the Italian Colony of Eritrea on the Red Sea (*Commerce Repts.*, July 26, 1917) and from Rhodesia, ("Fibres from Various Sources," *Bull. Imperial Inst.*, Vol. 15, 1917).

HISTORY OF GEOGRAPHY AND EXPLORATION

Exploration by Airplane. In his presidential address to the Geographical Section of the British Association for the Advancement of Science in 1916 (reproduced in the *Geogr. Journ.*, Vol. 48, 1916) Reeves estimated the area of the earth's surface unsurveyed and unmapped in any sense to be approximately one-seventh of the total (60,000,000 square miles). The major part of this unknown area lies in the Polar Regions; the remainder in continental interiors and tropical jungles. Final conquest resolves itself mainly into a question of transportation. The time element determined by transportation is all-important in initial geographical exploration, and by the means lately at our disposal it is but slowly that the explorer penetrates the ice-choked sea, the waterless desert, and the equatorial forest. Avoidance of the prime difficulties of the surface by travel through the air is not new as an idea; today it has become a practicable possibility. Already a pioneer aerial expedition is on its way to attack the heretofore unconquered interior of New Guinea. Its prospects have been described in the *Review* (Eric Mjöberg: A Proposed Aerial Expedition for the Exploration of the Unknown Interior of New Guinea, *Geogr. Rev.*, Vol. 3, 1917). Advantages of the airplane for exploration in Central and South America have recently been suggested by R. H. Millward (Exploring and Mapping Jungle Lands by Aeroplane, *Flying*, January, 1918). Mr. Millward spent five years mapping the forested department of Peten, Guatemala; he is convinced that with the aid of aerial transport the work might have been accomplished in four months and with a great saving in the toll on human life. Economically, too, by facilitating the reconnaissance of forestal resources and exploitation of mineral wealth the airplane would prove invaluable in such regions where extractive industry is in its early stages.

Turning to the other geographical extreme we find the use of the airplane in the Arctic advocated by Captain Robert Bartlett in consequence of experiences during his late voyage to Etah for the relief of the Crocker Land Expedition (Possible Aero Landing Places En Route to North Pole, *Flying*, October, 1917; cf. also article by B. M. Connell: The Aeroplane in Arctic Exploration, *Scientific American*, Sept. 30, 1916). Under the most favorable conditions water navigation in the far north must contend against the dangerous ice floe and frequently against surface fog. Aerial navigation would avoid these difficulties and further would shorten the trip. From St. John's, Newfoundland, to Etah is 3,000 miles by sea; by air line it is about half, or even by following deviations of the coasts to secure suitable landing places—a list of these at intervals of 50 miles is given by Captain Bartlett—the aerial journey would still be considerably shorter. To within 400 miles of the Pole suitable landing places could be established on terra firma; beyond, emergency landings could be made on the flat ice floes. And return might be made to Cape Chelyuskin on the Siberian side!

GEOGRAPHICAL NEWS

Foundation of the South African Geographical Society. On June 8, 1917, the South African Geographical Society was founded in Johannesburg. At the organizing meeting in the School of Mines Dr. G. S. Corstorphine occupied the chair, and Mr. J.

Hutcheon made an address on "Geography: Its Field and Its Future." In the course of his remarks Mr. Hutcheon explained that the objects of the society would be to raise the standard and safeguard the interests of the subject and those teaching it, to encourage geographical research in all its branches, and to arouse in the general public more enthusiasm therein. In time the society would, it was hoped, grant a diploma of fellowship (*South African Journ. of Sci.*, Oct., 1917, p. 136).

PERSONAL

MR. W. H. BABCOCK, president of the Anthropological Society of Washington, gave an address on "Some Anthropological and National Factors in the Present War" at a meeting of that society on April 23. Mr. Babcock has published several articles on the history of geography and cartography in the *Review*: "Atlantis and Antillia" (May, 1917); "Markland, Otherwise Newfoundland" (October, 1917); "Corvo, Our Nearest European Neighbor" (January, 1918).

PROFESSOR ALBERT PERRY BRIGHAM of Colgate University received the honorary degree of Doctor of Science from Syracuse University at its recent commencement.

DR. W. A. CANNON, of the Department of Botanical Research of the Carnegie Institution, sailed in April to Australia and will be away from the United States about twelve months. He will visit certain of the more arid portions of West and South Australia, where he will make field studies of the desert plants with especial reference to root habits. Dr. Cannon published an article on "The Physiography and Vegetation of the Algerian Sahara," in Vol. 45, 1913, of the *Bulletin of the American Geographical Society*.

PROFESSOR T. C. CHAMBERLIN, head of the department of geology at the University of Chicago, recently gave the Norman Wait Harris Lectures at Northwestern University. The general subject of the course was "Glaciers, Ancient and Modern," and the individual subjects were: "Birth, Growth, and Mature Stages of Glaciers"; "The Decline, Death, and Residual Products of Glaciers"; "Existing Glaciation and the Place It Gives the Present Epoch in the Cycle of Climates"; "The Glaciation of the Last Geological Period"; "The Glaciation of the Earlier Geological Ages"; and "The Assigned Causes of Glacial Periods; The Climatic Outlook."

MR. G. P. ENGELHARDT read a paper before the New York Entomological Society on April 16, entitled "Faunal Zones in Southwestern Utah."

MRS. LAURIE R. FRAZEUR lectured on May 10 before the Geographic Society of Chicago on "Mt. Robson and the Big Smoky River Country." She described two trips, one in the summer with horses, and the other in mid-winter with dogs, north of the Frazer River and Mt. Robson over the continental divide and down the headwaters of the Big Smoky River, which is the largest tributary of the Peace River. This region, some of it unexplored and some of it covered only by route surveys, was represented on the map of the Canadian Rocky Mountains between Jarvis and Yellowhead Passes, 1:300,000, published by this Society (*Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, facing p. 494).

DR. E. O. HOVEY of the American Museum of Natural History gave a lecture at Mount Holyoke College on February 20 entitled "Two Years' Experience in the Arctic with the Crocker Land Expedition."

DR. CHARLES KEYES, of Des Moines, Iowa, has been chosen by the Democratic party of Iowa candidate for United States Senator to succeed Senator W. S. Kenyon, whose term shortly expires.

DR. A. L. KROEBER, professor of anthropology in the University of California, read a paper before the New York Academy of Sciences on April 22 entitled "Factors Controlling Human Behavior as Illustrated by the Natives of the Southwestern United States." Professor Kroeber discussed the inherited social characteristics, the influence of local environment, and the historical development and contacts of definite civilizations.

CAPTAIN LAWRENCE MARTIN, National Army, associate professor of physiography and geography at the University of Wisconsin, is on duty in the Military Intelligence Section, War College Division, Office of the Chief of Staff, War Department, Washington, D. C. He has charge of the map room at the War College and of the maps in the offices of the War Council and of the Chief of Staff, and does geographical work for the General Staff in the Combat Branch of the Intelligence Service.

DR. JOHN LYON RICH, of the Department of Geology at the University of Illinois, has been commissioned a captain in the National Army. He is assigned to Washington, D. C., for service in the Intelligence Branch of the army as a specialist in geography.

Dr. Rich is the author of the paper on "Cultural Features and the Physiographic Cycle" in the October, 1917, *Review*.

DR. P. A. SPEEK of the Library of Congress addressed the Anthropological Society of Washington on February 26 on "The Problems of Race and Nationality in Russia." An abstract of his paper is given in the *Journal of the Washington Academy of Sciences* of April 4.

SIR AUREL STEIN, since returning from England to Srinagar, Kashmir, has been engaged on the completion of "Serindia," the great final publication on his second expedition (1906-08), preparing the materials brought back from his third great journey (1913-16), and revising the drawings of the fifty map sheets on the scale of 1:500,000 which the Trigonometrical Survey of India has in hand for publication. This atlas will comprise all the surveys effected in Chinese Turkestan and westernmost China in the course of the three explorations. Its revision entails heavy labor, but there is every promise of satisfactory technical execution on the part of the Survey, and the atlas will add substantially to geographical knowledge (*London Times Literary Suppl.*, May 3, 1918, p. 205).

DR. C. D. WALCOTT, Secretary of the Smithsonian Institution and lately Director of the U. S. Geological Survey, was recently awarded the Wollaston Medal by the Geological Society of London in recognition of his contributions to geology and Cambrian paleontology.

PROFESSOR J. E. WOODMAN of New York University read a paper before the New York Academy of Sciences on April 15 entitled "Notes on the Physiography of Nova Scotia."

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

GENERAL

LAUT, A. C. **The conquest of the Great Northwest, being the story of the Adventurers of England known as The Hudson's Bay Company: New pages in the history of the Canadian North-west and Western States.** 2 vols. in one. Vol. 1, xxi and 409 pp.; maps, ill.; Vol 2, vii and 415 pp. Moffat, Yard & Co., New York, 1914. \$2.00. 8½ x 6.

Part I, 93 pp. (1610-1631), deals with the four voyages of Henry Hudson and the adventures of Jens Munck and other Danes in Hudson Bay. The material is derived from original sources and is presented in a concise way. (The map facing page 22 in Vol. 1 needs revision with reference to the flow of the Polar Currents. The author's comparison between Dr. Nansen and Hudson and the description of driftwood and currents will not stand analysis.) Part II and the first portion of Part III, pp. 97 to 409 (1662-1760), treats of the explorations of Radisson in company with Groseillers and the first voyage of the fur hunters, which, under the leadership of Radisson, promptly brought into existence a company of gentlemen adventurers trading to Hudson Bay. These adventurers immediately proved astoundingly successful and secured a charter from King Charles II to form the Hudson's Bay Company. This was the most remarkable charter ever issued, since it deeded practically all of modern Canada, including the great Northwest and all of the United States west of the Mississippi River. "The purest piece of feudalism ever perpetrated on America depending upon the idea that the earth was the Stuart's, to be disposed of at will."

Next came the French raiders, under the leadership of d'Iberville, a leader at once wily and resourceful, secretly backed with the power of the French King. The exploits of Radisson and d'Iberville deeply involved the diplomacy of the English and French courts with plot and counter-plot. General histories covering this period omit the very material necessary for the full rehearsal of those important events. This material is supplied in the present work and is a sufficient reason why this volume should find a prominent place in libraries of history as well as of exploration. It is densely packed with data from original sources, with full references.

The times were troublous. More than one naval engagement was fought in Hudson Bay. Forts were captured, sacked, demolished; recaptured, rebuilt, resacked; only to pass again through the same stirring cycle of changes. As the sable, under Yermak, gave vast Siberia to Russia, so the beaver, in the hands of the Hudson's Bay Company, gave vast leagues of Canada to Great Britain.

Volume 2, consisting of Part III concluded and Part IV (1810-1870), deals with the real conquest of the Great Northwest—its exploration and beginnings of settlement. Indeed, so thoroughly did runners, guides, trappers, and special explorers overrun this entire territory, that not a stream where a beaver could float a stick, not a pond where he could build a house was overlooked. It is within the bounds of probability that every portion of the Great Northwest, including the northern tier of the United States west of the Mississippi, British Columbia, Saskatchewan, and the vast mountain ranges to the Arctic Ocean was known to agents resident oftentimes for long intervals at the several forts which were scattered through the territory. The country was surely well known to the trappers; nothing was left virgin for modern explorers.

This period of exploration and conquest was not confined to the present bounds of Canada, but covered Wisconsin, North Dakota, Montana, Idaho, Wyoming, Nevada, Utah, Washington, Oregon, and California. The stories of events within this long period are not so much a history of the times as they are the biographies of such intrepid leaders as Mackenzie, MacTavish, Thompson, Frazer, Astor, McGillivray, MacDonald, Robertson, Selkirk, Simpson, and Lord Strathcona. In a broader sense the entire story of the discoveries, the explorations, and the subjugations is but the summary of the biographies of Hudson, Radisson, d'Iberville, Selkirk, and Strathcona. The work has much to commend it, especially the many pages of notes, and the fact that "tons of Hudson's Bay records were examined as original data for the compilation of the book."

W. S. C. RUSSELL

SWANTON, J. R., AND R. B. DIXON. **Primitive American history.** Reprinted from *Amer. Anthropologist*, Vol. 16, 1914, No. 3, pp. 376-412.

A critical examination of the migration history of the various tribes north of Mexico, based on native tradition and the earliest historical record. The conservative treatment of the authors lends great weight to their final conclusions, which merit quotation at length: "The tribes of several of our stocks may be referred back to a swarming ground, usually of rather indefinite size but none the less roughly indicated. That for the Muskogean, including probably some of the smaller southern stocks, must be placed in Louisiana, Arkansas, and perhaps the western parts of Mississippi and Tennessee, although a few tribes seem to have come from the region of the Ohio. That for the Iroquoians would be along the Ohio and perhaps farther west, and that of the Siouans on the lower Ohio and the country to the north, including part at least of Wisconsin. The dispersion area for the Algonquians was farther north about the Great Lakes and perhaps also the St. Lawrence, and that for the Eskimo about Hudson Bay or between it and the Mackenzie River. The Caddoan peoples seem to have been on the southern plains from earliest times. On the North Pacific coast we have indications that the flow of population has been from the interior to the coast. This seems certain in the case of the Indians of the Chimmesyan stock and some Tlingit subdivisions. Some Tlingit clans, however, have moved from the neighborhood of the Nass northward. Looking farther south we find evidence that the coast Salish have moved from the inner side of the coast ranges, while a small branch has subsequently passed northward to the west of it. The Athapascan stock in all probability has moved southward, sending one arm down the Pacific coast and a larger body presumably through the Plains, which reached as far as northern Mexico. Most of the stocks of the Great Plateau and of Oregon and California show little evidence of movement, such indications as are present, however, pointing toward the south as a rule. The Pueblo Indians appear to have had a mixed origin, part of them coming from the north, part from the south. In general there is to be noted a striking contrast between the comparatively settled condition of those tribes west of the Rocky Mountains and the numerous movements, particularly in later times, of those to the east."

DOUGLAS, W. B., edit. **General Thomas James' three years among the Indians and Mexicans.** 316 pp.; map, ill., bibliogr., index. Missouri Historical Society, St. Louis, 1916. \$4.50. 9 x 6½.

KROEBER, A. L. **Tribes of the Pacific coast of North America.** *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 1, Section 1: Anthropology, pp. 22-37. Washington, D. C., 1917.

UNITED STATES

North Atlantic States

GOLDTHWAIT, J. W. **Evidence for and against the former existence of local glaciers in Vermont.** Maps, ill. *Repts. of the State Geologist on the Mineral Industries and Geol. of Vermont*, Vol. 10, 1915-1916, pp. 42-73. Burlington, 1916. [It is the author's opinion that local alpine glaciers have never existed in the Green Mountains. The supposed evidences, striae, "terminal moraines," etc., previously brought forward are to be explained by the ordinary operations of the continental ice sheet. Moreover cirques and other signs of local ice action are wanting from the higher summits where they would naturally be found had climatic conditions ever proved suitable. But the climate at the close of the glacial period in Vermont appears to have been too mild for the development of local snow fields and alpine glaciers. In the light the study throws upon the climatic conditions of the period the problem has more than a local interest.]

HATCH, LAURA. **Marine terraces in southeastern Connecticut.** Diagr., ill. *Amer. Journ. of Sci.*, No. 262, Vol. 44, 1917, pp. 319-330.

JEWETT, A. L. **Official publications of the state of New York relating to its history as colony and state.** 62 pp.; bibliogr., index. *New York State Library Bibliogr. Bull.* 59 (=Univ. of the State of New York Bull. No. 635). Albany, 1917.

JOHNSON, E. R. **The economic causes of New York's supremacy.** Ills. *New York Evening Post: Greater Port of New York Suppl.*, June 20, 1917, pp. 2-4. [Abstracted in the August, 1917, *Review*, Vol. 4, p. 145.]

KEIR, MALCOLM. **Some responses to environment in Massachusetts.** Maps, diagrs., ill. *Bull. Geogr. Soc. of Philadelphia*, Vol. 15, 1917, No. 3, pp. 121-138; No. 4, pp. 167-185.

MILLER, W. J. **The Adirondack Mountains.** 97 pp.; maps, diagrs., ill., bibliogr.,

index. *New York State Museum Bull. No. 193*. Albany, 1917. ["The purpose of this book is to present in simple, nontechnical language a general outline of the geography, rock formations, physical history, and human history of the region." Sources for further study are suggested in the bibliography. Illustrations include small sketch maps and diagrams and many photographs: there is a location map and a generalized topographic map.]

OSTRANDER, J. E. **A summary of meteorological records for twenty-five years—1889 to 1913, inclusive.** *Massachusetts Agric. Experiment Station Bull. No. 153*, pp. 121-146. Amherst, 1914.

PARKINS, A. E. **The development of transportation in Pennsylvania.** Maps, ills., bibliogr. *Bull. Geogr. Soc. of Philadelphia*, Vol. 14, 1916, No. 3, pp. 92-114; No. 4, pp. 148-168; Vol. 15, 1917, No. 1, pp. 1-18.

PETERSON, A. E., AND G. W. EDWARDS. **New York as an eighteenth century municipality.** xxvii and 459 pp.; map, ills., index. (Studies in History, Economics and Public Law, Faculty of Political Science, Columbia University.) Longmans, Green & Co., New York, 1917. \$5.00. 9 x 6. [In 1905 the minutes of the Common Council of New York for the pre-Revolutionary period were made available by printing and indexing. They form the indispensable source for this study, in which the geographer will find much interesting material, chiefly in the sections relating to trade and industry and transportation (growth of the municipal ferry system).]

— **Pittsburgh, Pennsylvania, Report of Flood Commission of.** xv and 452 pp.; maps, diagrs., ills., bibliogr., index. Flood Commission of Pittsburgh, 1912. \$10. 10½ x 8.

RICH, J. L. **An instance of the changing value of geographical location.** *Journ. of Geogr.*, Vol. 15, 1916-17, No. 6, pp. 185-189. [Hobart topographic sheet, at the head of Delaware River.]

RODDY, H. J. **Physical and industrial geography of Lancaster County, Pennsylvania.** vi and 113 pp.; maps, diagrs., ills. New Era Printing Co., Lancaster, Pa., 1916. 75 cents. 9½ x 6.

SARTORIS, ANTONIO. **Fra gli italiani emigrati nella Pennsylvania.** *Italica Gens*, Vol. 6, 1915, No. 3-6, pp. 132-135. Turin.

SEYMOUR, E. G. **New York City and the development of trade: A reading list.** 39 pp.; ill. Public Library, New York, 1914. 7 x 5. [Works of history and fiction illustrating the growth of the city from the discovery to the present day.]

SPILLMAN, W. J., H. M. DIXON, AND G. A. BILLINGS. **Farm management practice of Chester County, Pa.** 99 pp.; maps, diagrs., ills., index. *U. S. Dept. of Agric. Bull. No. 341*. Washington, D. C., 1916. [A tabulation and interpretation of data obtained from survey of operations of over 600 farms which should prove valuable in detailed regional study.]

TUCKER, F. B. **New York's military map of the year 1778.** Map. *Engineering News*, Vol. 75, 1916, No. 25, p. 1172.

UNDERHILL, R. M. **Ancient Long Island.** *Survey*, Vol. 35, 1915, Dec. 11, pp. 291-293. [Effects of long isolation are to be seen in the remote—or but recently remote—shore villages of Nassau County, Long Island. Manner of life is primitive; old traditions are preserved; the stranger is an object of suspicion; inbreeding, by intensifying defects, has produced a high percentage of feeble-mindedness.]

WERNER, C. J. **A history and description of the manufacture and mining of salt in New York State.** 144 pp.; map, ills. Publ. by the Author, Huntington, Long Island, 1917. \$15.00. 9 x 6.

MEXICO AND CENTRAL AMERICA

GARCÍA, GENARO, edit. **The true history of the conquest of New Spain, by Bernal Díaz del Castillo, one of its conquerors.** Translated into English, with introduction and notes, by A. P. Maudslay. Maps, ills., bibliogr., indexes. Vol. 1, lxxv and 396 pp.; Vol. 2, xvi and 343 pp.; Vol. 3, 38 pp. (with maps and plans); Vol. 4, xiv and 395 pp.; Vol. 5, xv and 463 pp. (*Hakluyt Soc. Publs.*, 2nd Series, Vols. 23-25, 30, and 40.) The Hakluyt Soc., London, 1916. 9 x 6 each.

Bernal Díaz del Castillo was connected with the exploration and conquest of Mexico from beginning to end. He was with Córdoba and Grijalva on their voyages along the coast of Yucatan. He served throughout the campaign against the Mexican empire and accompanied Cortes on the terrible expedition to Honduras. For fifty years he took part in the subjugation of the land. *Encomiendas* were granted him, first in Coatzacoalcas,

later in the *audiencia* of Guatemala. He attended the congress of Valladolid in 1550, and, unmoved by the humanitarian pleadings of Las Casas, voted that the *encomiendas* should be assigned to the conquistadores in perpetuity. Few of the stirring events of the conquest were unknown to this sturdy pioneer. Herein lies the value of his work.

A soldier rather than a scholar, Díaz del Castillo had not attempted to record his adventures until long after the conquest had been completed. Then he found it difficult to recall many details of the story. In spite of that his account has become one of the most important records of that heroic period. Antonio de León Pinelo and Enrique de Vedia, in their bibliographies, speak highly of his work. Herrera and Torquemada quote him frequently. Robertson depended upon his descriptions, and Prescott ranked his work as next in importance to Gomara's, while the Mexican historians, Genaro García, Vicente Riva Palacio, and Alfredo Chavero consider his account an indispensable contribution to our knowledge of early Mexican history. At least twenty editions of Díaz del Castillo's history have been published, in six different languages.

This is not the first English translation of the work. But Keatinge in 1800 and Lockhart in 1844 based their translations upon the text published by Friar Alonzo de Remón (Madrid, 1632), and that edition differed greatly from the original. The manuscript was preserved in Guatemala, and in 1904 Genaro García, having compared a written and a photographic copy of it, published the history in Mexico. Maudslay's work is a translation of that carefully prepared edition. The Spanish chroniclers were far from accurate at best, and as their accounts are the only source of information regarding those great voyages of discovery and conquest it is well worth while to preserve them exactly as written. This new translation is amply justified.

The first four volumes of Díaz del Castillo's history tell of the conquest of Mexico, including the early explorations of the coast of Yucatan and Tabasco. Volume 3 is devoted exclusively to maps. It contains the very interesting pre-Columbian plan of a part of Mexico City, made on maguey paper, with names of canals and causeways added in Spanish, probably soon after the conquest. A part of the fifth volume describes the remarkable expedition made by Cortes from Mexico to Guatemala and Honduras (1524-1526), in which he led an army of Spaniards and Indians over marshes, across rivers, and through dense forests in territory that even today can boast of few trails over which a horse can travel and must receive its mail and supplies by boat or by carriers on foot. For purposes of comparison a translation of Cortes' Fifth Letter to the Emperor describing this expedition is included in the volume; and the translator, having traveled over the region himself, charts the route probably followed by the conquistadores.

The country through which the Spaniards passed showed no signs of the higher Maya civilization. No well-built cities were encountered nor were any mentioned by the Indians along the way. The route followed must have been just beyond the frontier of Maya influence at that time. In Tabasco the natives lived in settlements beside streams or lakes, traveling only by watercourses. They were more helpless than the Spaniards when trying to cross the interfluvial spaces. Farther south among the mountains of Guatemala a somewhat higher culture was found. The people cultivated extensive fields of maize, kept poultry (probably turkeys), and possessed cacao plantations. They carried on extensive commerce between their principal towns, along well-established routes of trade by land as well as on streams. The traders mentioned by Cortes and Díaz del Castillo may have been the traveling merchants (*pochteca*), who often journeyed far from their guild towns on the Anahuac plateau, serving as pioneers for Mexican political expansion. Apparently they did not come from Yucatan. Maudslay concludes that the Maya civilization whose ruins are found in the region traversed by Cortes had declined long before this time. This accords with ideas advanced by Morley, who, from his recent studies of Maya hieroglyphs, estimates that the cities in the south had been abandoned about the end of the sixth century.

Mr. Maudslay has not acted simply as translator of this history, but has added notes on the geography and archeology of Mexico, which with the maps that accompany the work greatly enhance its value.

BARBERENA, S. I. *Informe de los servicios meteorológico y sismológico de El Salvador*. *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: Astronomy, Meteorology, and Seismology, pp. 642-644. Washington, D. C., 1917.

— [Canal Zone] weather conditions for the year, 1917. *Panama Canal Record*, Vol. 11, 1918, No. 23, p. 246.

G[ORDON], G. B. *The trail of the Golden Dragon*. [*Univ. of Pennsylvania Museum Journ.*, Vol. 9, 1918, No. 1, pp. 29-38. [Relationship between myth and environment in Central America.]

HUNTINGTON, ELLSWORTH. *Maya civilization and climatic changes*. *Diagr. Proc. Nineteenth Internatl. Congress of Americanists held at Washington, Dec. 27-31, 1915*, pp. 150-164. [Smithsonian Institution], Washington, D. C., 1917.

LANDA, LUIS. *Estado actual de la meteorología y sismología en Honduras*. *Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 2, Section 2: *Astronomy, Meteorology, and Seismology*, pp. 727-730. Washington, D. C., 1917.

LÓPEZ, ELPIDIO. *Estudio sobre los estados del tiempo que corresponden a cada uno de los tipos de carta (primera aproximación) y para algunas regiones de la República Mexicana*. *Maps. Bol. Mensual del Observatorio Meteorol. y Seismol. Central de México*, 1916, No. 10, pp. 207-212. Sec. de Fomento, Colonización, e Industria, Mexico. [From a study of available records—very incomplete for certain sections—Mexican weather has been resolved into ten types. Each of these is represented graphically and is briefly discussed.]

LÓPEZ, ELPIDIO. *Influencia de los ciclones tropicales sobre el estado del tiempo en el Valle de México*. *Map. Bol. Mensual del Observatorio Meteorol. y Seismol. Central de México*, 1916, No. 10, pp. 203-206. Sec. de Fomento, Colonización, e Industria, Mexico. [From time to time extraordinary rainfalls have been recorded in Mexico City: in Sept., 1915, for instance, 3½ inches of rain fell in four hours. These are hurricane rains developing in the rear quadrant of the violent tropical cyclone. In the above article meteorological conditions during eight such storms are shown in tabular form, the paths of the storms being indicated on a map.]

MEANS, P. A. *History of the Spanish conquest of Yucatan and of the Itzas*. *Maps, ills., bibliogr. Papers of the Peabody Museum of Amer. Archaeol. and Ethnol., Harvard University*, Vol. 7, 1917, pp. 1-206.

— *Mexico: General descriptive data*. 47 pp.; maps, ills. Pan American Union, Washington, D. C., 1916.

— *Mexico's petroleum industry*. *Ills. Mexican Rev.*, Vol. 2, 1917, No. 1, pp. 4-7, 10-11, and 13.

MORLEY, S. G. *The rise and fall of the Maya civilization in the light of the monuments and the native chronicles*. *Maps, ills. Proc. 2nd Pan American Sci. Congress, Dec. 27, 1915, to Jan. 8, 1916*, Vol. 1, Section 1: *Anthropology*, pp. 192-208. Washington, D. C., 1917. [A series of eight maps shows the distribution of Maya civilization at the chief stages of its development. Hieroglyphic inscriptions provide a chronology for the Old Empire that flourished during the first six centuries of the Christian era in what now are the states of Chiapas and Tabasco in Mexico, the departments of Peten and Izabal in Guatemala and the adjoining western part of Honduras. The Old Empire terminated about 600 A. D. in a rapid decline of which the causes have been variously conjectured. Two conjectures have a special geographical significance. Cook has suggested exhaustion of the soil following primitive exploitation; Huntington, increased rainfall with stimulated growth of the natural vegetation to a degree against which Maya agriculture could not contend. A migratory movement northward during the last period of the Old Empire made the first stage of the cultural florescence in Yucatan; a renaissance of Maya civilization reached its apogee in the eleventh century. Sources for the history of the New Empire exist in the native chronicles.]

EUROPE

BALKAN STATES, INCLUDING RUMANIA

— *Albania, Relazione della Commissione per lo studio dell'*. Part I: *Studi geologici*, by Giorgio Dal Piaz and Antonio De Toni; *Studi geografici*, by Roberto Almagià. 81 pp.; maps, diagrs., ills. Part II: *Studi agrológicos*, by Umberto Rosati and Gaetano Baudin. 195 pp.; diagrs., ills. Società Italiana per il Progresso delle Scienze, Rome, 1915. Both vols. 5s. 3d. 11 x 7½.

To judge from the data gathered in these two volumes of the Italian Association for the Advancement of Science, a notable forward stride has been made in our knowledge of Albania in the course of the last decade. The country has not recovered from the devastating effects of Turkish misrule, and the backward state of its inhabitants is apparent when their social organization is compared with that of their neighbors. Yet the different reports forming the text of the present work indicate the existence of an economic foundation on which the building of a thriving Albanian state is possible.

Of particular interest is Professor Almagià's account of the geographical features which have conferred historical importance on Albanian harbors. The likelihood of a revival of commercial activity to be directed along the routes which formerly extended cross-country in an east-west direction is intimated. This is a favorite Italian concep-

tion. It needs, however, the test of application to prove whether ancient trade routes like the Via Egnatia will be able to compete with the better frequented north-and-south avenues of Balkan trade.

The authors believe in the possibility of promising developments in agriculture and call attention to results already attained in the vicinity of Valona by their countrymen as well as by Greek operators. The need of proper instruction in industrial methods of operation or exploitation is apparently most pressing. To offset this condition the authors suggest inviting Albanians to Italian institutions and the building of agricultural schools in Albania. The region described with greatest detail is western Albania between Valona and Durazzo. It is to be hoped that this investigation will be followed by a similar survey of the rest of Albanian territory.

LEON DOMINIAN

ARABU, N. *Les régions voisines de la mer de Marmara*. Map. *Ann. de Géogr.*, No. 143, Vol. 26, 1917, pp. 353-375. [Sketch of the geological history.]

EREDIA, FILIPPO. *Sul clima di Salonicco*. Diags. *Boll. Reale Soc. Geogr. Italiana*, Vol. 5, 1916, No. 12, pp. 980-1006. Rome.

GAUTIER, E.-F. *La pointe de Sedd-ul-Bahr*. Map, ills. *Ann. de Géogr.*, No. 132, Vol. 23-24, 1915, pp. 433-437.

HAUMANT, ÉMILE. *La pays dinarique et les types serbes, d'après Mr Jovan Cvijić*. *Ann. de Géogr.*, No. 132, Vol. 23-24, 1915, pp. 407-419. [Abstracted in the *Review*, Vol. 3, 1917, pp. 324-325.]

MAREK, RICHARD. *Südost-Europa und Vorder-Asien: Griechenland*. *Geogr. Zeitschr.*, Vol. 22, 1916, No. 9, pp. 510-527.

NICOLESCO, MIRON. *Distribution géographique du pétrole en Roumanie*. Ills. *Atti X Congr. Internaz. di Geogr.*, Roma, 1913, pp. 1194-1207. Reale Società Geografica, Rome, 1915.

PREZZOLINI, GIUSEPPE. *La Dalmazia*. 75 pp. Libreria della Voce, Florence, 1915. L. 1. 10 x 7.

RECHINGER, KARL. *Korfu*. 18 pp.; ills. (Vegetationsbilder, Ser. 12, No. 4. Herausgegeben von G. Karsten and H. Schenck.) Gustav Fischer, Jena, 1914.

TÄUBER, C. *Meine Durchquerung der nordalbanischen Alpen im April 1914*. Ills. *Jahrbuch des Schweizer Alpenclub*, Vol. 50, 1914 and 1915, pp. 3-29. Bern, 1916.

WEISS, J. *Zur Verkehrsgeographie Serbiens*. Map, ills. *Österreichische Monats-schr. für den Orient* (herausgegeben von K. K. Österreichischen Handelsmuseum in Wien), Vol. 41, 1915, No. 9-12, pp. 274-276.

WOODS, H. C. *The Salonika campaign*. *Scottish Geogr. Mag.*, Vol. 33, 1917, No. 2, pp. 65-73.

AFRICA

SUDAN AND UPPER GUINEA

BRUEL, GEORGES. *Bibliographie de l'Afrique Équatoriale Française*. iv and 326 pp.; index. Gouvernement Général de l'Afrique Équatoriale Française. Emile Larose, Paris, 1914. 10s. 10 x 6½.

M. Bruel is Chief Administrator of the colonies. This list of 7029 titles, classified by author and by periodicals (anonymous articles), covers the whole of French Africa south of the Sahara. Even a newspaper paragraph of a few lines is listed if it contains a date or other bit of information not found elsewhere. France has had a great number of official and volunteer investigators in the field; and this important work will give to students of French Equatorial Africa the same great service that Grandidier's "Bibliography of Madagascar" renders to students of that island.

CYRUS C. ADAMS

RAPHAEL, J. R. *Through unknown Nigeria*. xix and 361 pp.; ills., index. T. Werner Laurie, Ltd., London, [1914?] 8s. 6d. 9 x 6.

The title is somewhat misleading, for Barth was a standard authority on large areas of Nigeria a half century ago, and six or seven excellent books have appeared within the past twelve years, all dealing with one or another area that Raphael describes. The book gives many accurate impressions of the land, its peoples, and activities. The author has almost nothing to say about the production of cotton—an economic question of great interest in England.

There are frequent references to the Fulani and the Hausa peoples. The term Fula is preferable to Fulani, as the latter is merely the Hausa variant of the name. But every allusion to these peoples is merely incidental. The average reader gets no con-

ception of the fact that they are two of the most conspicuous races of Africa, very unlike each other, but both remarkable in their characteristics and history.

The author shows that the policy of Goldie and Lugard, in dealing with the Hausa and Fula population, is the guiding principle of the government today. The aim is to encourage and foster all that is good in the native life and to suppress only slave-raiding and other evil practices which retard development.

An extended account is given of Kano, the famous city of central Sudan and the focus of the whole Mohammedan population. The policy of the British, in that city and in all the provinces tributary to it, is to rule by and through the natives, leaving them to select their own emirs, who must, however, be approved by the British governor. The control of this enormous and intensely fanatical part of the population was a delicate problem, but the English have solved it, as is proved by the apparently complete acquiescence of the Mohammedans.

Kano is surrounded by a wall of dried mud, as hard as rock, eleven miles long, fifty feet high and forty feet wide at the base. The population of 30,000 has room in this enclosure for many fields and pastures. The mud houses are comfortable; even Europeans live in them, and the cheapest rent for a few dollars a year. The Kano market, famous throughout Africa, is the collecting and distributing point for trade between the central Sudan and the Mediterranean. The crowds at the market, on the busiest days, number from 10,000 to 12,000.

The chief Niger port has long been Forcados, at the mouth of one of the delta streams. It is greatly to the advantage of the Niger ocean trade that a new port has recently been built at Burutu, four miles up stream from Forcados, where two ocean vessels at a time may take on or discharge freight.

CYRUS C. ADAMS

THIEROLF, HANS. *Neunzig Jahre Tschadsee-Forschung: Versuch einer historischen Darstellung des Tschadseebildes.* 81 pp.; maps, diagrs., bibliogr. Dissertation Universität Giessen, 1914. 9 x 5½.

A summary of the history and results of Lake Chad exploration from Denham (1823) to Tilho (1912-13). The reports and other publications on which the monograph is based include 43 titles. Summing up the scientific results, Dr. Thierolf says that the area of the lake has considerably diminished within the 90 years of observations, though the differing determinations of its size are undoubtedly due, in part, to the fact that some explorers have seen the lake at periods of comparatively small, and others at periods of unusually large precipitation. The long duration of the *harmattan* especially induces high evaporation. There is no reason to believe that the lake will disappear.

According to Tilho, the highest level of the lake is in December and the lowest in August, the difference between them being four-fifths of a meter. The channels in the lagoon regions, Tilho says, have an average depth of 2½ to 3 meters, but the mean depth in free water is less. Explorers have differed widely as to the "taste" of Chad's waters. Barth and Nachtigal both declared the water to be sweet; Dubois and Lenfant said it was sweet only at high water. Tilho says the water is brackish and its salinity increases with the distance from the mouths of tributary streams.

Nachtigal said that about 100 inhabited islands are strewn over a third of the lake's area. D'Huart found that all the islands have the same general direction from north-northwest to south-southeast and attributed this fact to the influence of the *harmattan* and of the current in the lake caused by the entering waters of the Shari River. He also distinguished three groups of islands: those that are inhabited and rise from 10 to 15 meters above lake level, those that are 4 to 5 meters high and are used as meadows, and the low islands that are only half a meter or less above the lake's surface.

CYRUS C. ADAMS

ADAM, J. *Le Djoloff et le Ferlo.* Map. *Ann. de Géogr.*, No. 132, Vol. 23-24, 1915, pp. 420-429. [Two regions of central Senegambia.]

ANGOULVANT, —. *La Côte d'Ivoire.* 131 pp.; map. Gouvernement Général de l'Afrique Occidentale Française, Bingerville, édit. of 1915.

BELTRÁN Y RÓZPIDE, R. *El porvenir de la Guinea española.* *Rev. de Geogr. Colon. y Mercantil*, Vol. 13, 1916, No. 6-7, pp. 256-258.

BROOKS, C. E. P. *The rainfall of Nigeria and the Gold Coast.* Maps, diagrs. *Quart. Journ. Royal Meteorol. Soc.*, No. 178, Vol. 42, 1916, pp. 85-106 (discussion, pp. 104-106). [Abstracted in the *Review*, Vol. 2, 1916, p. 378.]

— *Cabo Verde, A mão d'obra agrícola na provincia de.* *Bol. Soc. de Geogr. de Lisboa*, Ser. 34, 1916, No. 4-6, pp. 214-227.

— *Cameroons and Togoland, The administration of the.* Maps. *Geogr. Journ.*, Vol. 48, 1916, No. 5, pp. 406-407. [With maps constructed from official com-

munications "in accordance with the best information as to the district boundaries now at the disposal of the Society."']

CHUDEAU, RENÉ. **Le climat de l'Afrique occidentale et équatoriale.** Maps, diagsr. *Ann. de Géogr.*, No. 138, Vol. 25, 1916, pp. 429-462.

CHUDEAU, RENÉ. **L'Ouadaï.** Bibliogr. *La Géographie*, Vol. 30, 1914-15, No. 4, pp. 292-294. Paris. [Summary of the physical geography of Wadai based on recent publications.]

CHUDEAU, RENÉ. **Quelques progrès en Afrique occidentale en 1915 et 1916.** *Renseign. Colon. (Suppl. à l'Afrique Franç.)*, 1916, No. 10-12, pp. 257-261.

GIRONCOURT, G. DE. **La descente du bas Niger dans la zone des rapides.** Map, ill. *La Géographie*, Vol. 30, 1914-15, No. 4, pp. 251-256. Paris.

HUBERT, HENRY. **Progression du dessèchement dans les régions sénégalaises.** *Ann. de Géogr.*, No. 143, Vol. 26, 1917, pp. 376-384.

HUBERT, HENRY. **Sur les climats de l'Afrique occidentale.** Reprint from *Comptes Rendus de l'Acad. des Sci. [de Paris]*, Vol. 161, 1915, Aug. 9, pp. 142-144.

KITSON, A. E. **The Gold Coast: Some considerations of its structure, people, and natural history.** Ills. *Geogr. Journ.*, Vol. 48, 1916, No. 5, pp. 369-392 (discussion, pp. 391-392).

MARTIN, CAMILLE. **Togo et Cameroun.** 89 pp.; maps. Comité de l'Afrique Française, Paris, 1916. 2 fr. 9 x 5½.

PALADINO, GIUSEPPE. **Nuovi documenti dell'ultimo viaggio di Pellegrino Matteucci, 1880-1881.** *L'Africa Italiana*, Vol. 35, 1916, No. 10, pp. 227-236.

PHYSICAL GEOGRAPHY

GEOLOGY AND GEOMORPHOLOGY

WOLFF, FERDINAND VON. **Der Vulkanismus.** 1. Band: Allgemeiner Teil. 1. Hälfte: Das Magma und sein geologischer Gestaltungsvorgang. Die vulkanischen Erscheinungen der Tiefe. Der submarine Vulkanismus. viii and 300 pp. 2. Hälfte: Die vulkanischen Erscheinungen der Oberfläche. Lunarer und kosmischer Vulkanismus. Geschichte der Vulkanologie. pp. 301-711. Maps, ill. F. Enke, Stuttgart, 1913 and 1914. 10 x 6½.

These are the first and second parts of the first volume—one-half of the whole work when completed—of a modern scientific handbook on vulcanism, working up the latest researches of Rosenbusch, Van Hise, Brögger, Daly, Becke, and many others. The first volume explains the volcanic phenomena by the physical conditions under which they occur. The petrographical, physical, and chemical problems involved in volcanic processes receive special attention. Careful examination of these problems seems to prove that the direct causes of the eruptions are variations of pressure and temperature which disturb the chemical equilibrium of the magma. The author also discusses at some length the differences of the Atlantic and Pacific types of the magma. The former surrounds the Atlantic Ocean and forms the volcanic rocks of almost all the continents, and the oceanic islands; the latter surrounds the Pacific Ocean and forms also the volcanic rocks of the three Mediterranean regions.

In the oldest geological times the Pacific magmas dominated. The first Atlantic rocks are not discernible until the Silurian, and they do not noticeably increase before the end of the Palaeozoic era. Their domination begins in the Tertiary. It seems then that a gradual change of the chemical composition of the magma accompanies the geological history of the earth.

The submarine manifestations of vulcanism seem to be much more intense than those on the land. The existing volcanoes on the land continue to use craters of Quaternary or Tertiary origin, but on the floor of the oceans new ones are formed even in the geological present. Their connection with the magma is much more direct than that of the surface volcanoes, the temperature of those lavas which reach the surface (Hawaii, Samoa) having been found considerably higher than that of the land volcanoes.

The larger part of the second half of the first volume is devoted to the problems of surface vulcanism, followed by chapters on cosmic vulcanism and the history of vulcanology. The author distinguishes three classes of surface eruptions: linear, areal, and central. The last type, the most frequent in the geological present, is the one commonly understood by the word volcano. It may be an elevation or a depression (Hawaii). The three classes evidently correspond to three degrees of intensity of the volcanic forces, the areal eruptions being the strongest, the central the weakest type. In a normal

volcanic cycle the three succeed each other chronologically, as may be observed in the volcanic regions of Iceland, Ireland, and Scotland. In intrusive rocks, the neck represents the central, the dike the linear, the batholith and laccolith the areal, intrusion.

The author describes the phenomena and products of the different classes of eruptions, with many examples from all parts of the world, placing especial emphasis on the physical and chemical sides of the processes.

Considering the dominating part which the process of cooling of liquid silicates plays in all kinds of volcanic activity, vulcanism cannot be an exclusively terrestrial phenomenon, but must occur wherever in the universe magma passes from the hot liquid into the crystallized state, allowing such alterations as correspond to the different physical conditions of the respective celestial bodies.

The magma of the moon cannot be very different from that of the earth, because the average density of the two is approximately the same. But all the phenomena dependent on pressure and tension must show certain differences. On the moon the highest degree of contraction was on the actual surface, which, contracting more rapidly than the lower portions, suffered the great breaks whose effects are seen in the enormous faults and fissures which characterize the relief of the moon as well as the absence of folded mountains. Likewise the crust of the moon, not re-enforced by sedimentary masses, offered less resistance than the earth to the attack of the volcanic forces from within. Volcanic action on the moon could therefore be one single huge process which continued with decreasing intensity until it had exhausted itself, while on the earth there were repeated periods of volcanic action corresponding to periods of disturbances of the crust and of varying, though on the whole also decreasing, intensity.

It would not do, therefore, to consider the present state of the moon as an example of the probable future condition of the earth, because here the endogenous forces are opposed by the exogenous, and the latter must finally be victorious, reducing the topography to the peneplane stage which will never be reached on the moon on account of its lack of water and atmosphere.

The author has succeeded in presenting the extremely difficult matter in a lucid and unpretentious style intelligible to any student with the necessary preparatory knowledge, while the bibliographical references represent a small international library of modern vulcanology.

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ERRATA

- p. 1, lines 13-14: *for* irrevocable *read* implacable.
- p. 2, map: location of Limpa River (67° N. and 100° E.) and related Limpiisk Tundra is incorrect. Limpa River is a small tributary of the Lower Tunguska, entering it below the Syevernaya River in 66° N. and 88° E.
- p. 55, line 23: *for* 95-centimeter *read* 95-millimeter.
- p. 87, lines 7-8 of title under "Educational Geography": *change statement about insets as follows*: The physical and political map each with two insets, 1:75,000,000, the former with: (a) Natural Vegetation and Ocean Currents; (b) Mean Annual Rainfall and Prevailing Winds; the latter with: (a) Railway and Steamship Lines; (b) Population Density.
- p. 150, lines 19 and 35: *for* Rabi *read* Ravi.
- p. 150, line 18 from bottom: *for* karif *read* kharif.
- p. 210, line 17: *for* A. E. Tameron *read* A. E. Cameron.
- p. 240, line 3 of title of Fig. 1: *for* later routes or *read* later routes on.
- p. 242, line 24: *for* phantom *read* phantom.
- p. 333, lines 12-13 from bottom: *for* Maude *read* Maud.
- p. 344, line 5 from bottom: *for* "February Review" *read* "January Review."
- p. 346, bracketed line under title: *for* facing p. 360 *read* facing p. 358.

ADDITIONAL ERRATA IN PREVIOUS VOLUMES

Vol. I

- p. 237, line 9 of review of Mission Tilho: *for* Vol. 43, 1913, *read* Vol. 43, 1911.

Vol. II

- p. 46, line 9: *for* Trinok *read* Timok.

Vol. III

- p. 393, line 3 of footnote 9: *for* Joly and Goegi *read* Dozy and De Goeje.

Vol. IV

- p. 61, lines 3-4 of first item under Africa: *for* Bull. Soc. de Géogr. de Paris *read* Bull. Soc. de Géogr. Commenc. de Paris.
- p. 321, line 23: *for* Sir Allan Young *read* Sir Allen Young.
- p. 496, lines 20-21: *passage should read*: As first clearly delimited from surrounding parts of the coastal plain by Stone, the pine barrens are practically coextensive with the Beacon Hill (geological) formation.
- p. 496, line 8 from bottom: *add* No. 4, pp. 289-312; Vol. 53, 1917, No. 1, pp. 1-32; No. 2, pp. 169-187.

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